THE CARL MOYER PROGRAM ANNUAL STATUS REPORT

The Carl Moyer Memorial Air Quality Standards Attainment Program:

Incentives for Lower-Emission Heavy-Duty Engines

February 2004

California Environmental Protection Agency
Air Resources Board

TABLE OF CONTENTS

EXECUTIVE SUMMARY iii

I. INTRODUCTION 1

A. Total NO_x And Diesel PM Emissions 2
B. State Implementation Plan (SIP) 2

II. PROGRAM STRUCTURE, FUNDING, AND PROGRAM CRITERIA 4

A. The Role of ARB, Participating Districts, and CEC 4
B. Funding and District Participation 6
C. Program Criteria 8

III. THE HEAVY-DUTY ENGINE PROGRAM 10

A. Projects Funded Statewide 10
B. Estimated Emission Reductions 11
C. Cost-effectiveness 13
D. Environmental Justice 13

IV. CARL MOYER ENVIRONMENTAL INDICATORS PILOT STUDY 16

A. Previous Use of Environmental Indicators 16
B. Refining the Use of Environmental Indicators 17

V. CONCLUSIONS 19

A. Funding 19
B. Emission Reductions 19
C. Cost-effectiveness 19
D. Environmental Justice 19
E. Pilot Study on Using Environmental Indicators 20
F. Need for Continued Funding 20

TABLES

Table I-1 Statewide Emissions from Selected Heavy-Duty Engine Categories 2
Table II-1 Carl Moyer Program—State Funding 6
Table III-1 Types and Number of Engines Funded Statewide 11
Table III-2 Emission Reductions and Cost-Effectiveness (NO_x) 12
Table III-3 Environmental Justice Criteria 14
Table III-4 Funding and Emission Reductions in Environmental Justice Areas 15
Table IV-1 Environmental Indicators Used in the Carl Moyer Program 16

FIGURES

FIGURE III-1 FUNDING BY PROJECT TYPE 10

APPENDICES

APPENDIX A DISTRICT PROGRAMS A-1
APPENDIX B INFRASTRUCTURE AND ADVANCED TECHNOLOGY B-1

EXECUTIVE SUMMARY

The Carl Moyer Memorial Air Quality Standards Program (Carl Moyer Program) provides incentive funding to reduce smog-forming emissions from heavy-duty diesel-powered vehicles and equipment in an efficient, environmentally sound, and equitable way. Administered by the Air Resources Board (ARB) and local and regional air pollution control districts, the program funds emission reductions that are not already required by statute, rule, order, or regulation.

In the 1990s, as required by the federal Clean Air Act, ARB along with interested industries, environmental groups, and other government agencies developed a comprehensive long-term plan, the 1994 State Implementation Plan (SIP), designed to clean up California's air. Among other measures to reduce emissions from mobile sources, the 1994 SIP called for incentives to encourage the early introduction of lower-emission heavy-duty trucks and buses.

In 1998 the Governor and Legislature appropriated $25 million to implement the first incentive grant program for heavy-duty diesel engines. In February 1999 ARB formally approved the Carl Moyer Program to provide grants to local air districts to pay for the extra capital cost of cleaner-than-required diesel-powered heavy-duty vehicles and equipment. Later that same year, Assembly Bill 1571 (Villaraigosa, Brulte, Stats. 99, Chapter 923; Health and Safety Code, Section 44275, et. seq.) formally established the framework for this program.

The Carl Moyer Program has proven to be a cost-effective approach for immediately reducing emissions from heavy-duty vehicles. With the collaborative efforts of ARB and local air districts, the program funded about 4,950 cleaner engines. This includes over 2,080 alternative-fueled vehicles, especially transit buses and refuse trucks. The program has also replaced nearly 2,870 older diesel engines with new, cleaner diesel engines, primarily in marine vessels, off-road equipment, and agricultural irrigation pumps.

Staff estimates that heavy-duty engine projects funded during the first four years of the program reduce smog-forming oxides of nitrogen (NO_x) emissions by about 14 tons per day at an average cost of approximately $3,000 per ton. These projects also reduce diesel particulate matter (PM), a toxic air contaminant identified by ARB to cause cancer, by an estimated 1 ton per day. The NO_x and diesel PM emission benefits from Carl Moyer Program projects will continue for at least five years (the minimum project life) with some large engine projects involving locomotives or marine vessels continuing to provide lower emissions for 20 years or more.

During its first four years, the Carl Moyer Program received annual budget appropriations that totaled $114 million, $9 million of which was earmarked for infrastructure demonstration and advanced technology projects to be administered by the California Energy Commission (CEC). In 2002 voters reaffirmed the importance of a clean environment, including the Carl Moyer Program, by approving Proposition 40 – California’s

Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act. The intent of Proposition 40 is to preserve California's parks and coastal waters by cleaning up the air and environment. As such, Proposition 40 included approximately $40 million to continue implementing the Carl Moyer Program through a fifth and sixth year. No funds have been made available to continue the program beyond June 2004 (the sixth year).

ARB's goal is cleaner air for all Californians, including those living in areas that suffer from disproportionately high impacts of air pollution. Beginning with the fourth year of the program, districts with more than one million inhabitants were required to spend at least 50 percent of their Carl Moyer Program state funds in communities most significantly exposed to air contaminants, including communities of minority or low-income populations, or both. By early 2004, most districts will have fulfilled this requirement by committing from 50 to 80 percent of their Carl Moyer Program funds to projects meeting environmental justice criteria. These projects will help deliver emission reductions where they are needed the most.

From the start, agency staff implementing the Carl Moyer Program have used environmental indicators, such as NO_x emissions reduced per project, as a means of selecting projects for funding and evaluating the success of the program. During the current fiscal year staff are looking more closely at how environmental indicators may be used to further improve program effectiveness.

Regulations that require more stringent emission standards for new heavy-duty diesel engines will continue to be used as the primary strategy for reducing emissions; however, incentive measures like the Carl Moyer Program can play a critical role in California's strategy for achieving clean air. Incentive programs can help California meet fast-approaching attainment deadlines for the federal ozone standard by helping to equip existing equipment and vehicles with controls or cleaner engines and by introducing new technologies such as cleaner-than-required engines, aftertreatment systems, and alternative fuels. Even as new regulations are being developed for cleaner air in the long term, incentives can produce near-term reductions needed to protect Californians' health.

In October 2003, ARB updated the mobile source control strategy in California's ozone SIP with 13 new commitments focused, in large part, on regulatory strategies for reducing emissions from in-use vehicles and engines. The updated SIP recognizes the need for additional funding for heavy-duty incentive programs, such as the Carl Moyer Program, as a complement to ARB's regulatory agenda. With adequate funding, the Carl Moyer Program can buy critical near- and mid-term emission reductions that California needs to protect the public's health and help meet the state's air quality goals.

An indication of the potential for expanding the Carl Moyer Program is that the demand for program grants continues to exceed available funds. In the large regional districts of both northern and southern California, grant applications can exceed available funds by over 400%.

In 2000 the 13 members of the Carl Moyer Program Advisory Board, appointed by the

state Assembly, Senate, and California's Secretary of Environmental Protection, recommended to the Legislature that the program be funded at a minimum of $100 million a year through 2010. This recommended level of funding remains a valid recommendation today, necessary for California to achieve its health goals and meet federally mandated air quality standards.

I.

INTRODUCTION

The Carl Moyer Program was first funded in 1998 and formally established by the Legislature in 1999. The main objective of the Carl Moyer Program is to reduce NO_x emissions from diesel-fueled engines to help meet the requirements of the state's federally required SIP for ozone. In addition, the program helps reduce emissions of toxic diesel PM.

During the first five years of the program, most of the program's funding has been used for incentive grants to businesses and individuals to cover the incremental cost of cleaner-than-required heavy-duty engines, vehicles, and equipment. The engines and equipment purchased through the Carl Moyer Program replace higher polluting models. On a smaller scale, the program also has funded infrastructure demonstration and technology development projects to support the implementation of cleaner vehicle fleets and to bring cleaner technology to the market.

This report, required by Health and Safety Code 44295, provides information on:

1. Carl Moyer Program structure, funding, and grant criteria;
2. State funds allocated, including Proposition 40 bond funds;
3. Types of projects and number of engines funded;
4. Air pollution emission reductions;
5. Environmental justice requirements, projects, and funds spent; and
6. The Carl Moyer Program pilot project on the use of environmental indicators in administering the Proposition 40 bond funds.

Three previous reports to the Legislature (December 1999, April 2001, and March 2002--available at the ARB web site at www.arb.ca.gov/msprog/moyer/moyer.htm)--provide more detail on previous years of the program.

More than 1.2 million diesel-fueled engines operate in California—powering most trucks, buses, off-road construction and agricultural equipment, locomotives, and ships. These engines are a major source of air pollution, emitting a complex mixture of thousands of gases, vapors, and particles. These pollutants include ozone-forming NO_x, diesel PM, and more than 40 substances currently listed by the Air Resources Board (ARB or Board) as toxic air contaminants.

This chapter describes current statewide NO_x and diesel PM emissions, summarizes the state's plan to reduce air pollution and meet air quality standards, and explains the need for incentive programs to assist California in reducing emissions from heavy-duty diesel engines.

A. NO_x And Diesel PM Emissions

Heavy-duty diesel engines are significant contributors to California's air pollution problems. Although these account for less than five percent of the engines that power vehicles and mobile equipment in California, they produce approximately 40 percent of the state's NO_x emissions, an ozone-forming pollutant. Furthermore, ARB has identified diesel PM as a toxic air contaminant that can cause cancer. One study estimated that over 70 percent of the risk from toxic air contaminants in the South Coast Air Basin was linked to diesel PM emissions [Multiple Air Toxics Exposure Study II, South Coast Air Quality Management District (SCAQMD), 1999].

Statewide emissions of NO_x and diesel PM in 2005 from sources which are theoretically eligible for Carl Moyer Program funding are projected to be about 1,450 tons per day and 64 tons per day, respectively (ARB: 2002 emissions inventory). Statewide NO_x and diesel PM emissions from selected categories of heavy-duty diesel engines are shown in Table I-1.

Table I-1
Statewide Annual Average Emissions[a]
From Selected Heavy-Duty Engine Categories
(tons/day)

Source Category		On-Road Heavy-Duty Vehicle	Off-Road Equipment	Locomotive	Marine	**Total**
2005	**NOx**	**711**	**455**	**161**	**123**	**1450**
	Diesel PM	**17**	**32**	**5**	**10**	**64**

a. Statewide inventory data available at www.arb.ca.gov/app/emsinv/ccos/fcemssumcat_cc211.php. Emissions based on CCOS, version 2.211_RF932PEI, adjusted for South Coast SIP activity (South Coast AQMP Appendix III Base and Future Year Emission Inventories, August 2003) including updated growth factors. On-road estimates from EMFAC2002 ver.2.2 (Apr03 activity) are for heavy-duty diesel trucks and buses over 14,000lbs GVWR. Basis for off-road compression-ignition (Diesel) engines is ARB's OFFROAD emissions model.

B. State Implementation Plan (SIP)

The SIP is California's blueprint for meeting health-based federal ambient air quality standards by the deadlines set forth in the federal Clean Air Act. Under federal law, each state is required to submit a SIP describing how and when it will meet federal air quality standards. California's SIP is a compilation of region-specific plans that detail how each area will meet the air quality standards. The plan includes an estimate of the emission reductions needed to meet each air quality standard based on air monitoring results, data on emission sources, information about the benefits of existing emission control regulations, and complex air quality modeling.

Most emission reductions are achieved through "command and control" strategies: rules or

regulations requiring emission reductions for specific source categories. Stringent new vehicle (engine) emission standards are command and control strategies which result in significant emission reductions as older vehicles and equipment are replaced with new, cleaner models. However, incentive measures are also necessary because older, high-emitting heavy-duty diesel engines in vehicles and equipment last a long time and are frequently rebuilt to extend their service lifetime. In addition, some sources such as marine vessels, locomotives, and some other off-road equipment are under federal regulation and are exempt from California requirements.

Market-based incentive programs were first used in California's clean air plan as part of the 1994 SIP for ozone. The 1994 SIP included measures for light- and heavy-duty scrap programs, as well as incentives for the early introduction of lower-emission heavy-duty trucks and buses. The Carl Moyer Program implements that early introduction incentive measure. In October 2003, ARB updated the mobile source control strategy in California's ozone SIP with 13 new commitments focused, in large part, on regulatory strategies for reducing emissions from in-use vehicles and engines. In the 2003 SIP, ARB committed to obtain 109 tons per day of emission reductions of ozone-forming pollutants from already defined measures. Because further reductions are needed, the agency also committed to 97 tons per day of additional reductions from measures that have yet to be defined. With the attainment deadline of 2010 for the South Coast Air Basin only six years off, emission reductions from the Carl Moyer Program will be critical to meet these emission reduction commitments. Areas with nearer-term federal attainment dates, such as Ventura County, the Sacramento area, and the San Joaquin Valley can also benefit from the immediate emission reductions from Carl Moyer Program projects.

II.

PROGRAM STRUCTURE, FUNDING, AND PROGRAM CRITERIA

This chapter describes the roles of ARB, local and regional air pollution control and air quality management districts, and CEC in the Carl Moyer Program. It also summarizes funding and project selection criteria.

A. The Role of ARB, Participating Districts, and CEC

The Carl Moyer Program provides funding for three types of projects – heavy-duty diesel engine projects, infrastructure demonstration projects, and advanced technology projects. The heavy-duty engine program is administered by ARB and local air pollution control districts or air quality management districts (districts). The Infrastructure Demonstration program is administered by CEC and the districts. CEC also administers the Advanced Technology program.

1. The Role of ARB

ARB oversees the development and administration of the heavy-duty diesel engine element of the Carl Moyer Program. ARB's focus is to ensure that projects funded by the program produce real and quantifiable emission reductions that are surplus to reductions required by regulations. Working with the public, local air districts, port authorities, industry, and environmental groups, ARB develops and refines program guidelines. These guidelines describe the types of eligible projects and the criteria to qualify those projects, including formulas to calculate the emission benefits and cost-effectiveness. The guidelines are available in print from the ARB's Public Information Office or on-line at www.arb.ca.gov/msprog/moyer/2003moyerguide.pdf.

Each year, ARB solicits district participation in the Carl Moyer Program through formal written invitations. The districts apply to ARB for grants to implement local programs. ARB provides on-going assistance to the districts in the areas of program administration, project evaluation, and information on regulatory changes that affect project eligibility.

ARB hosts quarterly Incentive Program Implementation meetings with staff from the districts, the United States Environmental Protection Agency (U.S. EPA), CEC, and environmental and community representatives to discuss administrative, technical, and regulatory issues. In July 2003, ARB provided training for all district staff, including those from the eight districts that began participating in the program this year.

In addition, ARB reviews and monitors the progress of local districts' implementation of the program through periodic random audits. In 2001 ARB visited all participating districts to ensure local program administration met guideline requirements. Most recently, ARB audited the San Joaquin Valley Air Pollution Control District's (SJVAPCD) Carl Moyer

Program projects in the spring of 2003. In general, ARB has found that the districts have implemented the program according to the established guidelines and have achieved real and cost-effective emissions benefits.

2. The Role of Participating Districts

Participating districts implement the Carl Moyer Program according to the ARB guidelines. ARB developed the heavy-duty diesel engine program guidelines to allow each district to design and implement a program to meet specific local air pollution challenges. Implementation includes program outreach, project solicitation, project evaluation, award of grants, and project monitoring to ensure that emission reductions are achieved. Districts may set more stringent criteria than those listed in the guidelines, such as limiting funds for certain engine applications. Typically, districts annually issue one or more formal solicitations for engine, vehicle, and infrastructure projects.

To qualify to administer the Carl Moyer Program, districts must meet these requirements:

- Match funding – Districts must provide match funding for any Carl Moyer Program funding received from ARB.

- Project criteria – State-funded projects and district-funded match projects must meet the project criteria for the respective source category as described in the Carl Moyer Program Guidelines.

- Cost-Effectiveness – No project can exceed the program's cost-effectiveness limit. The original cost-effectiveness requirement was $12,000 per ton of NO_x reduced. It has been raised twice to account for inflation and is currently at $13,600 per ton.

- Environmental justice – Beginning with the fourth year of the Carl Moyer Program, Health and Safety Code Section 43023.5 (AB1390, Firebaugh) required districts with more than 1 million inhabitants to spend at least 50 percent of their state incentive funds, including Carl Moyer Program funds, in a manner that directly benefits low-income communities and communities of color that are disproportionately affected by air pollution.

- Reporting – For each year of funding, all participating districts are required to provide initial, annual, and final program reports to ARB. An annual report is submitted after one year and a final report after two years. Both must include information on all projects funded, including estimated NO_x and diesel PM emission reductions and cost-effectiveness. ARB staff evaluates the reports and confirms the estimates of emission reductions.

3. The Role of CEC

For two years the Carl Moyer Program included $9 million in funding for an infrastructure and technology development component managed by CEC. Although these programs were successful, more recent funding has focused solely on the Carl Moyer Program's core mission of achieving near-term emissions benefits. Descriptions of the infrastructure and technology development projects are contained in Appendix B.

B. Funding and District Participation

Since the start of the Carl Moyer Program, the state has provided $140.58 million in funding to projects in 31 local air districts. Table II-1 shows annual allocations for each sector of the program and for ARB administration.

Table II-1
Carl Moyer Program — State Funding

	Year 1 (1998-99)	Year 2 (1999-2000)	Year 3 (2000-01)	Year 4 (2001-02)	Year 5[a] (2002-03)	Year 6[a] (2003-04)	Totals
Districts[c]	$24,500,000	$18,620,000	$44,100,000	$15,680,000	$19,680,000	$18,000,000	**$140,580,000**
CEC		$4,000,000	$5,000,000				**$9,000,000**
ARB administration[b]	$500,000	$380,000	$900,000	$320,000	$400,000	$400,000	**$2,900,000**
Totals	**$25,000,000**	**$23,000,000**	**$50,000,000**	**$16,000,000**	**$20,080,000**	**$18,400,000**	**$152,480,000[d]**

a. State funds for years 5 and 6 are from Proposition 40.

b. ARB receives up to 2 percent of the funding to administer the program.

c. See Table A-1 in Appendix A for funding by district.

d. Total program funding was $154 million. $1.52 million of the Proposition 40 funds paid for the cost of issuing bonds.

1. State Funds

The Governor and the Legislature appropriated a total of $114 million dollars to fund the program during the first four years. In 2002, California voters approved Proposition 40, California's Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act, which included $50 million for grants to reduce air emissions from diesel-fueled equipment operating in California. For the fifth and sixth years of the Carl Moyer Program), approximately $40 million of the bond funds were allocated to the Carl Moyer Program engine program and $10 million to purchase cleaner school buses (not administered under the Carl Moyer Program).

The Carl Moyer Program has seen a steady increase in district participation. The number of districts participating in the program has grown from 16 in the first year to 30 in the fifth year. Over that time, 31 districts have applied for and received funding from ARB to implement the Carl Moyer Program in their areas (See Table A-1 in Appendix A for

participating districts and year distribution of funds).
An indication of the potential for expanding the Carl Moyer Program is that the demand for program grants continues to exceed available funds. In the regional air districts, grant applications can exceed available funds by over 400%. For example, in year 5 the SCAQMD received $36.2 in applications for $8.1 million in Carl Moyer Program funds. The Bay Area Air Quality Management District received over $13 million in applications for $1.9 million in funds.

2. Status of Grants Using Proposition 40 Funds

The Carl Moyer project cycle – from the district's application to ARB for funds to the final funding of individual projects – can take up to two years. While some districts have already selected projects and allocated all of their fifth year funds, most districts are still in the process of soliciting and evaluating grant applications for fifth year funding under Proposition 40. By July 30, 2004, the districts must file their first annual report on the allocation of those funds along with calculations of the anticipated emission reductions.

3. District Matching Funds

Districts are required to provide matching funds in order to receive state funding to implement a local program. In most cases, district-funded match projects must meet the project criteria for the respective source category as described in the Carl Moyer Program Guidelines. However, districts are allowed to pay for the incremental fuel costs of alternative fuels with matching funds, provided those funds come from the air district's budget. In addition, up to 15 percent of the match funds may be identified as in-kind contributions (i.e., administrative costs). The matching fund requirement is critical because it obligates those responsible for program selection, monitoring, and enforcement to make a monetary commitment to the program. Table A-2 in Appendix A shows the matching requirements for each participating district.

During the first two years, districts provided $1 in match funding for every $2 of Carl Moyer Program funding for engine incentives. When state funds for the third year program were increased to $50 million, districts would not have been able to provide increased matching funds. As a result, the Legislature capped the statewide matching fund requirement starting in the program's third year at $12 million. In recognition of the fiscal realities for many counties, the state has waived the matching fund requirement in the fifth and sixth years for districts receiving the minimum allocation of $100,000.

4. Carl Moyer Program Advisory Board

The Carl Moyer Program Advisory Board was created under Assembly Bill 1571 with the responsibility for evaluating the Carl Moyer Program and seeking continued funding should the program merit the recommendation to continue. The Advisory Board was composed of 13 members, four appointed by the Assembly and the Senate and nine appointed by California's Secretary of Environmental Protection. In its March 2000 report, the Advisory

Board reaffirmed the success of the program by recommending to the Legislature that the program continue to be funded at a minimum of $100 million a year through 2010. The Board also recommended that ARB includes diesel particulate matter (PM) reductions in the program.

C. Program Criteria

The heavy-duty engine projects of the Carl Moyer Program are selected based on guidelines adopted by ARB. The first Carl Moyer Program guidelines were adopted in February 1999. The guidelines have since been revised in November 2000 and April 2003. Projects receiving grants during the fifth year must meet the criteria in the April 2003 guideline revisions.

1. Eligible Engine and Equipment Categories

The engine portion of the Carl Moyer Program, administered by ARB and the local districts, funds the incremental cost of cleaner heavy-duty vehicles and equipment in the following categories:

- On-road motor vehicles over 14,000 pounds gross vehicle weight rating
- Off-road equipment over 50 horsepower
- Marine vessels
- Auxiliary power units
- Locomotives
- Stationary agricultural pump engines
- Forklifts
- Airport ground support equipment

The program also funds emission reduction equipment such as aftertreatment systems (e.g., diesel particulate traps) and idle reduction devices.

The types of engines and equipment eligible for funding vary by project category. For some categories, the only technology currently available that can achieve significant, cost-effective emission reductions is alternative-fuel technology. For other categories, baseline (pre-project, existing diesel engine) emission levels are very high, and substantial emission reductions can be achieved with new diesel engines.

For heavy-duty engine projects that may not meet the guideline criteria, the districts may work with project proponents to submit proposals to ARB for consideration on a case-by-case basis. ARB evaluates those projects based on technological feasibility, the potential for real, quantifiable emission reductions, cost-effectiveness, and the likelihood of other applicants going forward with that type of project.

The program does not fund engine research and development, certification testing, training, or operational controls.

2. Infrastructure and Fuel Costs

District-funded infrastructure projects qualify as matching funds for the Carl Moyer Program. Funds used to purchase or upgrade infrastructure must support equipment and vehicles meeting the Carl Moyer Program criteria.

3. Cost-Effectiveness Criterion

The current cost-effectiveness limit is $13,600 per ton of NO_x reduced. The Carl Moyer Program funds a project's "incremental cost," which is the difference between the cost of an engine that meets the legal emission standard and the cleaner replacement engine which exceeds the standard. This cost of reducing the emissions is used in calculating the project's cost-effectiveness. In the first four years of the program, cost-effectiveness has averaged less than $3,000 per ton of NO_x reduced.

III.

THE HEAVY-DUTY ENGINE PROGRAM

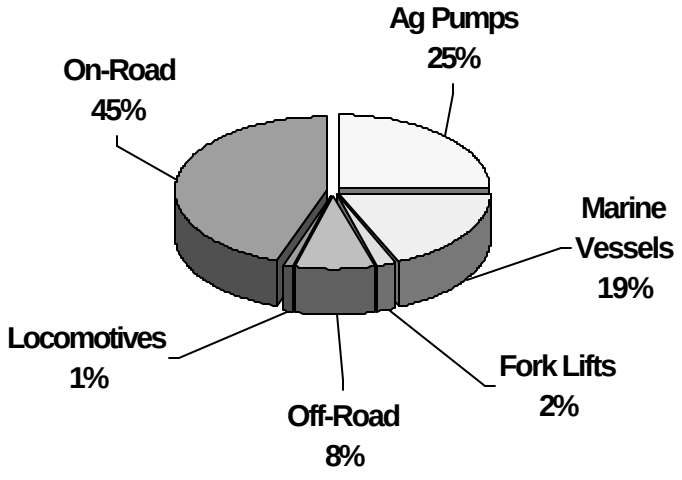
Incentive grants for cleaner heavy-duty engines and equipment are the core of the Carl Moyer Program. Over 90 percent of the program's funds are allocated to pay for heavy-duty engine projects. This section reports on the types of engines and equipment funded, the estimated NO_x and diesel PM emission reductions, and the status of project funding in environmental justice areas.

A. Projects Funded Statewide

Districts have funded engines from every source category under the Carl Moyer Program except airport ground support equipment. This includes heavy-duty line-haul trucks, urban transit buses, school buses, waste haulers, delivery trucks, off-road equipment, agricultural pumps, marine vessels, locomotives, forklifts, and auxiliary power units. The projects included new engines, new alternative fueled engines, and electric motors. In the first four years of the program, about 4,950 engines (both on-road and off-road) were funded statewide. Of those engines, about 2,080 were alternative-fueled engines or electric motors and about 2,870 were diesel-fueled engines.

Figure III-1

Funding by Project Type (Years 1-4)



The emission reductions achieved by Carl Moyer Program projects must be surplus (over and above any regulatory or other legal requirement). As shown in Figure III-1 and Table III-2, substantial percentages of the funding go to equipment categories such as agricultural pumps and marine vessels that have been exempted from regulation or subject to limited federal regulation. Because of this, replacing these engines often offers the most cost-

effective emission reductions. In addition, the Carl Moyer Program has funded many lower-polluting, alternatively fueled vehicles such as transit buses and refuse haulers that operate in the urban areas where residents are exposed to unhealthy levels of air pollution.

Table III-1
Types and Number of Engines Funded Statewide
Years 1-4

Source Category/ Equipment Type	Number of Engines		Total Funds		Total Funds[a]
	Alt Fuel	Diesel	Alt Fuel[a]	Diesel[a]	
On-Road					
Line Haul	87	49	3,826,637	1,081,315	4,907,952
Refuse Hauler	668	37	20,253,546	684,830	20,938,376
Transit Bus	778	4	11,309,741	93,318	11,403,059
School Bus	20	0	401,551	0	401,551
Other	177	65	3,401,753	1,141,384	4,543,137
Off-Road Equipment					
Agriculture	1	89	2,800	912,210	915,010
Construction	0	106	0	4,498,869	4,498,869
Other	76	27	1,385,740	913,726	2,299,466
Ag Pumps	56	2150	1,141,567	22,543,840	23,685,407
Locomotives	2	21	820,000	299,985	1,119,985
Fork Lifts	211	0	1,904,403	0	1,904,403
Marine Vessels	0	319	0	17,429,687	17,429,687
Total	2076	2867	44,447,738	49,599,163	94,046,901

a. Based on projects funded or with grant commitments. Approximately $9 million remains to be committed.

B. Estimated Emission Reductions

The primary objective of the Carl Moyer Program is to reduce smog-forming NO_x emissions from diesel-powered engines; however, reducing diesel PM is also a very important public health objective. Starting in fiscal year 2000-01, a diesel PM reduction target of 25 percent is encouraged for all participating districts and required for SCAQMD and SJVAPCD – both areas with serious non-attainment status for the federal diesel PM standard. Table A-3 in Appendix A lists the amount of funds each of the districts obligated in the first four years, the annual NO_x and diesel PM emission reductions, and the weighted average cost-effectiveness for NO_x reductions.

1. Statewide Program NO_x Benefits

Once all Year 4 Carl Moyer Program funds are spent, staff estimates the program's NO_x emission reductions will reach over 5,100 tons per year (about 14 tons per day). This estimate is based on emission reductions from projects currently funded or with grant

commitments (approximately 4,650 tons per year) plus reductions from those projects expected to be funded with the remaining $9 million of Year 4 funds (about 450 tons per year). Table III-2 below shows NO_x emission reductions and cost-effectiveness by project category. Because Carl Moyer projects last from 5 to 20 years, ARB expects emission reductions from these projects to continue to benefit air quality into the next decade.

2. Diesel Particulate Reductions

There are compelling public health reasons to reduce diesel PM emissions. In 1998 ARB identified diesel PM as a toxic air contaminant. PM, like ozone, has been linked to a range of serious health problems. Fine diesel particles are deposited deep in the lungs and can result in increased hospital admissions and emergency room visits; increased respiratory symptoms and disease; decreased lung function, particularly in children and individuals with asthma; alterations in lung tissue and respiratory tract defense mechanisms; and premature death. One study has estimated that over 70 percent of the health risks from toxic air contaminants in the South Coast Air Basin are linked to diesel PM emissions. (Multiple Air Toxics Exposure Study II, SCAQMD, 1999)

Based on this and other studies, it has become more critical to include diesel PM reductions as an objective in the Carl Moyer Program. The 2000 revised Carl Moyer Program guidelines set a statewide program goal to achieve a 25 percent emission reduction for diesel PM for the third and future year programs. The SCAQMD and the SJVAPCD, which are in serious non-attainment for the federal PM_{10} standard, are required to meet an average 25 percent PM_{10} emission reduction for their local programs.

Based on data from the first four years, ARB estimates statewide diesel PM reductions will be 260 tons per year. This

Table III-2
NO_x and PM_{10} Emission Reductions And Cost-Effectiveness (NO_x)[a]
(Years 1-4)

Source Category/ Equipment Type	Total NO_x Reduced (tons/year)	Total PM Reduced (tons/year)	NOx Weighted Average Cost-effectiveness
On-Road			
Line Haul	183	6.6	$4,500
Refuse Hauler	500	15.8	4,800
Transit Bus	503	32.5	2,300
School Bus	4	0.3	7,200
Other	143	5.7	4,400
Off-Road			
Agriculture	43	6.4	4,600
Construction	190	15.9	4,400
Other	62	6.1	4,400
Ag Pumps	1,910	92.2	2,500
Locomotives	44	5.0	2,600
Fork Lifts	162	0.0	3,600
Marine Vessels	907	48.9	$1,800
Total NOx	4651	235.4	

a. Based on projects funded or with grant commitments. Approximately $9 million of Year 4 remains to be committed.

estimate includes projects either funded or with grant commitments through Year 4 plus expected reductions from the remaining Year 4 funds. Table III-2 summarizes diesel PM emission reductions to date from the various types of equipment funded by the program.

In the third and fourth years of the program, both SCAQMD and SJVAPCD achieved more than the required 25 percent diesel PM emissions reductions. During those two years, Carl Moyer Program projects in the SCAQMD averaged diesel PM reductions of 33 percent and 89 percent, respectively. In the SJVAPCD, projects averaged PM diesel reductions of 43 percent and 48 percent.

C. Cost-Effectiveness

Cost-effectiveness – the cost of reducing a specific amount of a pollutant – is one of the criteria used in the Carl Moyer Program to select projects and evaluate the effectiveness of the use of program funds. Since NO_x emission reductions are the primary focus of the program, cost-effectiveness is calculated by dividing the annualized cost (in dollars) of a project by the annual NO_x emission reduction (in tons). Although all costs are attributed to NO_x reductions, many projects also reduce PM.

Overall, Carl Moyer Program projects have an average cost-effectiveness of approximately $3,000 per ton of NO_x reduced (categories ranged from $1,800 to $7,300). This compares very favorably with ARB estimates for the proposed 2003 SIP measures which average about $8,300 per ton of NO_x reduced (measures range from $1,100 to $22,000 per ton). Table III-2 lists the average cost-effectiveness for each major project category that is eligible for Carl Moyer Program funding.

Cost-effectiveness is not the only, or always the primary, factor considered in project selection. Some categories such as agricultural pumps and marine vessels are more cost-effective than other categories to fund because they have been either exempted from regulation or subject to limited federal regulation. Replacing older, uncontrolled pumps engines or marine vessel engines can produce large emission reductions. These projects make sense in areas with agricultural operations or heavy-duty marine vessel traffic. On the other hand, in some areas replacing older school buses, while not as cost-effective as other categories, may be higher priority because of the need to reduce children's exposure to harmful pollutants on their daily trips to and from school.

D. Environmental Justice

Historically, low-income communities and people of color have often had to live with more than their fair share of pollution. Growing awareness of this inequity has made ensuring fair environmental treatment of all people a high priority for California's environmental agencies. ARB has moved quickly in recent years to include environmental justice considerations in all its policies and programs, adopting "Policies and Actions for Environmental Justice" in December 2001.

Beginning with the fourth year of the Carl Moyer Program, environmental justice became a key focus of the program. Health and Safety Code Section 43023.5 (AB1390, Firebaugh) requires districts with more than 1 million inhabitants to spend at least 50 percent of their state incentive funds, including Carl Moyer Program funds, in a manner that directly benefits low-income communities and communities of color that are disproportionately affected by air pollution. Districts with less than a million residents are also encouraged to consider environmental justice in allocating Carl Moyer Program funds. The districts that must meet this requirement include:

- Bay Area Air Quality Management District (BAAQMD)
- Sacramento Metropolitan Air Quality Management District (SMAQMD)
- San Diego County Air Pollution Control District (SDCAPCD)
- San Joaquin Valley Air Pollution Control District (SJVAPCD)
- South Coast Air Quality Management District (SCAQMD)

Using their understanding of local issues and conditions, each district has developed environmental justice criteria that meet the special needs of its area. Table III-3 shows the criteria each district uses for ranking and selecting Carl Moyer Program projects to meet the environmental justice requirement.

Table III-3

Environmental Justice Criteria Used by Air Districts for Project Selection

	PM Exposure	Criteria or Toxic Pollutant Exposure	Poverty Level	Communities of Color	Sensitive Population[a]
Bay Area AQMD	X	X			X
South Coast AQMD	X	X	X		
San Joaquin Valley APCD			X	X	
Sacramento AQMD		X	X	X	
San Diego AQMD	X		X		
Mendocino County AQMD			X	X	
Monterey Bay Unified APCD		X	X	X	

a. Includes communities with high numbers of children and elderly (newborn to 17 and ≥65 years of age).

Some smaller districts have also developed environmental justice methodology to implement the Carl Moyer Program. This includes the Mendocino County Air Quality Management District and Monterey Bay Unified Air Pollution Control District .

Local districts are close to meeting the program's environmental justice goals. As

shown in Table III-4, three of these districts have spent more than 50 percent of their Carl Moyer funds in environmental justice areas. Two districts, the SJVAPCD and the BAAQMD, were either delayed in adopting their environmental justice criteria or in allocating all their Year 4 funds. ARB staff anticipates full compliance once their funds are fully allocated.

Table III-4
Funding and Emissions Reductions in Environmental Justice (EJ) Areas
(Year 4 – 2001-2002)

District	Total Funding	EJ Funding	Diesel PM reduced (tons/yr)	NO_x reduced (tons/yr)	Percentage Of Funding in EJ Areas
South Coast	$7,055,564	$5,559,950	6	168	**79%**
San Joaquin[a]	$2,757,263	$774,200	6	52	**28%**
Bay Area[b]	$1,570,344	$0	-	-	**0%**
Sacramento	$1,438,944	$957,417	1	47	**67%**
San Diego	$714,147	$437,025	1	22	**61%**

a. About one third of the district's funds for 2001-2002 have been allocated. The balance will be allocated by the end of 2003 or early 2004.

b. Project cancellations and program changes required that the Bay Area reallocate all of its Year 4 funds. It plans to allocate the funds and meet the EJ criteria in early 2004.

Staff estimates that fourth year Carl Moyer Program projects in environmental justice areas will reduce emissions from NO_x and diesel PM by about 290 tons and 14 tons per year, respectively, in the five most populated districts. These reductions are projected to increase to over 400 tons of NO_x and 20 tons of diesel PM per year when all fourth year funds are obligated. These projects provide immediate and long-term emission reductions (from a minimum of 5 years up to 20 years after the start of a project).

IV.

CARL MOYER PROGRAM ENVIRONMENTAL INDICATORS PILOT STUDY

In its appropriation of Proposition 40 bond funds for the Carl Moyer Program, the Legislature asked that ARB begin to quantify the intended environmental impacts using appropriate indicators that characterize the emissions reduced and, where applicable and quantifiable, the effects on human or ecosystem health. As an initial step toward this long term goal, ARB, in conjunction with the Secretary for Environmental Protection, is to report annually to the respective budget and policy committees on ARB's progress in using environmental indicators to administer the bond funds through the Carl Moyer Program.

During the current year of the program, staff is conducting a pilot project (Pilot) to look more closely at how environmental indicators may be used to evaluate and improve program effectiveness. This section of the 2003 Carl Moyer Program Status Report serves as a progress report on the Pilot.

Table IV-1

Environmental Indicators Used in the Carl Moyer Program

Pollutant emission reductions
- Oxides of Nitrogen (NO_x)
- Fine Particulate Matter (PM_{10})

Cost-Effectiveness
- Dollars spent per ton of NOx reduced

Funding in areas meeting environmental justice criteria

A. Previous Use of Environmental Indicators

Environmental indicators have been used extensively in most ARB programs including the Carl Moyer Program (Table IV-1). The Carl Moyer Program was started as a means of helping to achieve the NO_x reductions required in the state's clean air plan. In administering the program, NO_x and diesel PM emission reductions, along with cost-effectiveness, are essential criteria for both selecting projects for funding and evaluating the success of the program.

Some environmental indicators now used by the program staff relate environmental justice criteria. Health and Safety Code Section 43023.5 requires that districts containing more than one million inhabitants spend at least 50 percent of their state funds to reduce or eliminate the disproportionate impacts of air pollution on low-income and minority populations. The district must include information on which projects meet these criteria in their Carl Moyer Program reports starting with the fourth year (2001-2002). Section III of this report summarizes emission reductions, program cost-effectiveness, and progress in meeting environmental justice requirements.

B. Refining the Use of Environmental Indicators

Staff is using the Pilot as an opportunity to refine the use of environmental indicators as a means of evaluating and improving Carl Moyer Program effectiveness. For example, staff is evaluating its data management system, improving methods for calculating indicators, examining other possible indicators, and improving its training and communication with local district staff.

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1. Data Management

Since environmental indicators are only as good as the data from which they are derived, staff is focused on increasing the accuracy of the data used to calculate the indicators. The indicators currently used in the program (NO_x and diesel PM emission reductions, cost-effectiveness, and funds spent in environmental justice areas) are derived from district reports. Staff has thoroughly reviewed past reports, reporting methods, and data management procedures. Based on this evaluation, staff has identified areas for improving data management.

Staff is working with ARB's Office of Information Services and the districts to create a data management system that will be easier to use, more comprehensive, and more reliable. Direct data entry and automated verification is being considered to minimize human error and provide more accurate real-time information.

2. Methods for Calculating Environmental Indicators

Staff is evaluating the assumptions and methodologies used to calculate environmental indicators. At a minimum, staff regularly updates the parameters used in those calculations based on the best available information and makes necessary adjustments to ensure indicators account for new and forthcoming regulations.

Staff will continue to be proactive in learning about new engines and technologies to refine the emission rates used in Carl Moyer Program calculations. Frequent communication with engine manufacturers has significantly increased our understanding of engine compatibility and availability. Staff keeps apprised of new engine emission factors and regulations through regular interdivision meetings at ARB and communication with the U.S. EPA. Finally, ARB can use its heavy-duty vehicle test laboratory to test engine emissions.

3. Other Environmental Indicators

Staff may evaluate indicators relating to impacts of the program on greenhouse gases.

Staff is working with districts to identify and map the location of Carl Moyer Program projects that meet the environmental justice requirements. Spatial-temporal presentation of emission reductions could enhance our understanding and ability to communicate the impact of the Carl Moyer Program.

4. Communication

Staff is working to improve communication with district personnel who are responsible for selecting, monitoring, and reporting on Carl Moyer Program projects. A first step has been the assignment of an ARB staff liaison to each participating district and the publication of program updates which will be sent to the districts and posted on the ARB web site.

V.

CONCLUSIONS

The Carl Moyer Program incentive funding reduces air pollution from heavy-duty diesel engines in an efficient, environmentally sound, and equitable way. By replacing older, higher polluting heavy-duty diesel engines with newer, cleaner alternative fuel or diesel engines, the program helps reduce the adverse health effects of air pollution in California now and in the future. With environmental justice as a focus, the program delivers air pollution reductions where they are needed most.

A. Funding

In the first four years, the Governor and Legislature appropriated a total of $114 million to the Carl Moyer Program. With the passage of Proposition 40 in 2002, California committed an additional $40 million in funding for the program, $20 million for this year and next (years 5 and 6). The $154 million in funding for the first six years of this program has provided significant emission reductions, yet has cost California less than $1 per person per year.

B. Emission Reductions

With the completion of the first four years of the program, staff estimates that Carl Moyer Program projects will reduce NO_x emissions by over 5,000 tons per year (about 14 tons per day) and diesel PM by about 260 tons per year (about 1 ton per day). Carl Moyer Program projects, which last from 5 to 20 years, will reduce air pollution emissions into the next decade.

C. Cost-Effectiveness

During the first four years of the program, the average cost-effectiveness of Carl Moyer Program projects was approximately $3,000 per ton of NO_x emissions reduced. This compares very favorably with ARB estimates for the proposed 2003 SIP measures which averaged about $8,300 per ton of NO_x reduced.

D. Environmental Justice

In the most populated local air districts, environmental justice is a primary criterion for project selection. The environmental justice requirement is that at least 50 percent of the funding in districts with populations greater than one million go to projects benefiting low-income communities and communities of color that are disproportionately affected by air pollution. Currently, districts are close to satisfying that requirement. Three out of the five largest districts have already met the requirement, committing 60 to 80 percent of their Year 4 Carl Moyer Program funds to projects in areas meeting environmental justice

criteria. Staff estimates that by early 2004 all five will reach and surpass the requirement.

E. Pilot Study on Using Environmental Indicators

This year ARB staff began a pilot study to evaluate the use of environmental indicators in the Carl Moyer Program. To improve the accuracy of indicators already being used, such as NO_x and diesel PM emission reductions and cost-effectiveness, staff is examining ways of improving data management and expanding communication with the district staff who manage the program locally. It is also evaluating other indicators that could be used to evaluate and improve the program.

F. Need for Continued Funding

ARB and air districts around the state must continue to reduce emissions to meet federal air quality deadlines, achieve and maintain healthful air quality levels, and reduce public exposure to toxic air contaminants. The Carl Moyer Program can buy critical near- and long-term emission reductions that California needs to meet both the goals and timetables of the 1994 SIP as updated by the 2003 mobile source control strategies. Without incentive programs, emission reductions would have to be obtained solely through regulatory measures — reductions that are sometimes less cost-effective, usually dependent on slow normal fleet turnover for implementation, and, in federally regulated categories such as locomotives and marine vessels, outside California's regulatory authority.

An indication of the potential for expanding the Carl Moyer Program is that the demand for program grants continues to exceed available funds. In the large regional districts of both northern and southern California, grant applications can exceed available funds by over 400%.

In 2000 the Carl Moyer Program Advisory Board recommended to the Legislature that the program be funded at a minimum of $100 million a year through 2010. This recommended level of funding remains a valid recommendation today. Funding at this level would demonstrate that California is committed and on track toward achieving its health goals and meeting federally mandated air quality standards.

Continued funding would also help create a sustainable market for low-emission engines, giving fleets an incentive to invest in these technologies earlier than required. In turn, a continuing market encourages manufacturers to expand their cleaner-than-required engine offerings.

Appendix A

District Programs

Table of Contents

Local Air District Heavy-Duty Engine Programs 4
Antelope Valley Air Quality Management District (AVAQMD) 7
Bay Area Air Quality Management District 8
Butte County Air Quality Management District (BCAQMD) 9
Colusa County Air Pollution Control District (CCAPCD) 10
Feather River Air Quality Management District (FRAQMD) 11
Glenn County Air Pollution Control District (GCAPCD) 12
Imperial County Air Pollution Control District (ICAPCD) 13
Kern County Air Pollution Control District (KCAPCD) 14
Mendocino County Air Quality Management District (MCAQMD) 15
Mojave Desert Air Quality Management District (MDAQMD) 16
Monterey Bay Unified Air Pollution Control District (MBUAPCD) 17
North Coast Unified Air Quality Management District (NCUAQMD) 18
Northern Sierra Air Quality Management District (NSAQMD) 19
Northern Sonoma County Air Pollution Control District (NSCAPCD) 20
Sacramento Metropolitan Air Quality Management District (SMAQMD) 21
San Diego County Air Pollution Control District (SDCAPCD) 22
San Joaquin Valley Air Pollution Control District (SJVAPCD) 23
San Luis Obispo County Air Pollution Control District (SLOCAPCD) 24
Santa Barbara County Air Pollution Control District (SBCAPCD) 25
Shasta County Air Quality Management District (Shasta County AQMD) 26
South Coast Air Quality Management District (SCAQMD) 27
Tehama County Air Pollution Control District (TCAPCD) 28
Ventura County Air Pollution Control District (VCAPCD) 29
Inter-District Projects 30
New Air Districts (Amador, Calaveras, Lake, Lassen, Mariposa, Modoc, Siskiyou,Tuolumne) 31

Tables

Table A-1 Final District Program Funding for Heavy-Duty Engine Grants A-4

Table A-2 Required Matching Funds A-5

Table A-3 Funding, Emission Reductions, and Cost Effectiveness..... A-6

Local Air District Heavy-Duty Engine Programs

This appendix contains summaries of local air district Carl Moyer heavy duty engine programs. Table A-1 shows district participation and funding. Table A-2 shows the matching funds provided by the districts. Table A-3 summarizes spending, emission reductions, and cost-effectiveness.

Table A-1
Final District Program Funding for Heavy-Duty Engine Grants[a]

District Name	Year 1	Year 2	Year 3	Year 4	Year 5
Amador County APCD	-	-	-	-	$ 100,000
Antelope Valley AQMD	$ 302,571	$ 225,000	$ 450,000	$ 210,149	269,652
Bay Area AQMD	2,500,000	1,880,000	4,306,133	1,570,344	1,894,911
Butte County AQMD	-	77,842	176,750	75,000	100,000
Calaveras County APCD	-	-	-	-	100,000
Colusa County APCD	-	-	-	75,000	100,000
Feather River AQMD	-	69,101	176,750	75,000	100,000
Glenn County APCD	100,000	53,743	150,000	75,000	100,000
Imperial County APCD	134,800	69,993	176,750	75,000	100,000
Inter-district Projects	-	125,000	376,750	-	-
Kern County APCD	-	100,000	Funds Declined	-	100,000
Lake County APCD	-	-	-	-	100,000
Lassen County APCD	-	-	-	-	100,000
Mariposa County APCD	-	-	-	-	100,000
Mendocino County AQMD	-	62,018	150,000	75,000	100,000
Modoc County APCD	-	-	-	-	100,000
Mojave Desert AQMD	845,791	635,678	1,535,530	-	100,000
Monterey Bay Unified APCD	265,800	145,183	450,000	217,553	293,779
North Coast Unified AQMD	100,000	73,255	176,750	75,000	100,000
Northern Sierra AQMD	127,700	52,692	176,750	75,000	100,000
Northern Sonoma County APCD	113,900	-	150,000	75,000	100,000
Sacramento Metropolitan AQMD	1,927,791	1,677,042	3,909,604	1,438,944	1,981,316
San Diego County APCD	1,085,661	809,498	1,850,344	714,147	867,328
San Joaquin Valley APCD	4,399,801	3,187,452	7,644,979	2,757,263	3,187,325
San Luis Obispo APCD	157,800	83,196	176,750	75,000	100,000
Santa Barbara County APCD	302,571	225,000	450,000	210,149	208,902
Shasta County APCD	-	72,977	176,750	75,000	-
Siskiyou County APCD	-	-	-	-	100,000
South Coast AQMD	11,275,591	8,349,769	19,745,849	7,055,564	8,148,088
Tehama County APCD	-	-	150,000	75,000	100,000
Tuolumne County APCD	-	-	-	-	100,000
Ventura County APCD	860,220	645,561	1,543,561	605,888	728,699
Totals	**$24,499,997**	**$18,620,000**	**$44,100,000**	**$15,680,001**	**$19,680,000**

a. Based on projects funded or with grant commitments. Approximately $9 million remains to be committed.

Table A-2

Required Matching Funds[a]

District Name	Source[1]	Year 1	Year 2	Year 3	Year 4	Year 5
Amador		-	-	-		0
Antelope Valley	DMV Fund	151,286	112,500	122,449	105,074	134,826
Bay Area	DMV Fund	1,250,000	940,000	1,171,737	785,172	947,456
Butte	DMV Fund	-	38,921	48,095	37,500	0
Calaveras		-	-	-		0
Colusa	BUG	-	-	-	37,500	0
Feather River	DMV Fund	-	34,550	48,095	37,500	0
Glenn	DMV Fund, Settlement Actions, and General Fund	50,000	26,871	40,817	37,500	0
Imperial	DMV Fund	67,400	34,996	48,095	37,500	0
Interdistrict		-	-	102,517		
Kern Eastern (Desert)	DMV Fund, Excess Emission Fees	-	112,500	-	-	-
Lake		-	-	-		0
Lassen		-	-	-		0
Mariposa		-	-	-		0
Mendocino	DMV Fund	-	31,009	40,817	37,500	0
Modoc		-	-	-		0
Mojave Desert	DMV Fund, CMAQ	422,896	317,839	417,831	-	0
Monterey Bay Unified	DMV Fund	132,900	72,591	122,449	108,776	146,890
N. Sierra	DMV Fund	63,850	26,346	48,095	37,500	0
N. Sonoma	DMV Fund	56,950	-	40,817	37,500	0
North Coast	DMV Fund	50,000	36,627	48,095	37,500	0
Sacramento Metropolitan	DMV Fund, Measure Ad	963,896	838,521	1,063,838	719,472	990,658
San Diego	DMV Fund	542,831	404,749	503,495	357,073	433,664
San Joaquin Valley	DMVb Fund, CMAQc	2,199,901	1,593,726	2,080,266	1,378,631	1,593,663
San Luis Obispo	DMV Fund, Private Funding	78,900	41,598	48,095	37,500	0
Santa Barbara	DMV Fund, Mitigation Fee	151,286	112,500	122,449	105,074	104,451
Shasta	DMV Fund	-	36,488	48,095	37,500	
Siskiyou		-	-	-		0
South Coast	MSRC, Clean Fuels Fund	$5,637,796	$4,174,884	$5,373,020	$ 3,527,782	$4,074,044
Tehama	DMV Fund	-	-	40,817	37,500	0
Tuolumne		-	-	-		0
Ventura	DMV Fund, District Fees	430,111	322,780	420,017	302,944	364,350
Totals		**$3,209,178**	**$2,623,271**	**$12,000,001**	**$ 7,537,055**	**$ 8,425,652**

a. Sources of the matching funds include: Department of Motor Vehicles (DMV) — many districts receive funds from a surcharge on motor vehicle registration fees; Federal Congestion, Mitigation, and Air Quality Fund (CMAQ);Back-up Generator Funds (BUG); Local sources such as Measure A in Sacramento — a ballot measure that allocates half a cent of local sales tax for transportation improvements in the county

Table A-3

Funding, Emission Reductions, and Cost Effectiveness[a]

Years 1-4

District	No. of Engines	Grants (Allocations by Districts)	Reduced NOx (tons/year)	Reduced PM10 (tons/year)	NOx Wt Cost Effectivness
Antelope Valley	29	$1,155,158	44	3.0	$3,762
Bay Area	108	8,543,087	541	32.0	1,448
Butte	35	329,505	22	1.4	2,588
Colusa	11	75,000	4	0.2	2,906
Feather River	44	320,851	31	1.7	2,161
Glenn	50	322,040	38	2.1	1,652
Imperial	39	454,800	35	1.4	1,661
Inter-District	8	500,975	24	1.0	1,772
Kern	8	99,229	25	0	760
Mendocino County	15	266,833	16	0.1	2,667
Mojave Desert	67	2,339,485	69	5.5	5,406
Monterey Bay	47	1,078,316	33	2.5	4,879
North Coast	25	424,082	33	1.6	3,957
Northern Sierra	19	334,324	12	2.2	4,739
Northern Sonoma	27	246,660	15	0.5	2,060
Sacramento	862	8,941,363	474	19.2	4,742
San Diego	158	3,915,176	138	9.7	3,125
San Joaquin Valley	1,280	15,357,737	1,324	77.7	1,991
San Luis Obispo	31	459,962	15	0.9	4,263
Santa Barbara	46	1,175,829	43	2.8	4,173
Shasta	20	244,480	32	0.0	1,382
South Coast	1,860	43,581,893	1,553	58.0	3,334
Tehama	26	224,885	26	1.3	1,504
Ventura	128	$3,655,231	103	10.7	$3,618
Totals	4,943	$94,046,901	4,651	235.4	

a. NO_x reductions have been estimated based on obligated funds only.

Antelope Valley Air Quality Management District (AVAQMD)

Antelope Valley AQMD participated in the Carl Moyer Program since its inception. Over the four years of the Program, AVAQMD received a total of $1,187,720, which it matched with $491,310 in district funding. In the fifth year of the Carl Moyer Program, AVAPCD received $269,652 and will provide $ 134,826 in matching funds. To date, the AVAQMD has obligated almost all of its Carl Moyer Program funds from previous years.

The District typically distributes a call for projects to solicit applications for program funding. The District has awarded and obligated 97 percent of its fifth year allocation. The projects funded include two off road projects and six agricultural irrigation pumps. $79,985 in fifth year match funds is obligated under contract for an off-road project. The District's remaining match funds will be awarded by the end of the fiscal year.

AVAQMD has provided Carl Moyer Program incentive funds for 29 engines that operate in the district. These engines include alternative fuel on-road vehicles, and repowers of off-road equipment and agricultural pumps. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 44 tons of NO_x and 3 tons of PM reduction annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $3,762/ton of NO_x reduced. Table A-4 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-4
AVAQMD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	0	1	0	2	0	0	0	$146,657	$ 0
Refuse Hauler	9	1	5	0	0	0	1	0	671,135	26,500
Other	0	0	0	0	1	0	0	0	14,903	0
Off-Road										
Agriculture	0	0	0	0	0	1	0	0	0	21,000
Construction	0	0	0	0	0	1	0	0	0	60,412
Other	0	0	0	0	0	1	0	0	0	12,363
Ag Pumps	0	0	0	0	0	6	0	0	0	202,188
Totals	9	1	6	0	3	9	1	0	$832,695	$322,463

Bay Area Air Quality Management District

Bay Area AQMD has participated in the Carl Moyer Program since its inception. Over four years of the program, BAAQMD received a total of $10,256,477, which it matched with $ 4,146,909 in district funds. In the fifth year of the Carl Moyer Program, BAAQMD received $1,894,911 and will provide $947,456 in matching funds. To date, the BAAQMD has obligated all Carl Moyer Program funds for years one, two and three. It will complete obligation of year four funds in early 2004.

The district has received applications for year five funds requesting approximately $13.9 million. These application requests exceed BAAQMD's total allocation of Carl Moyer Program funds for all five years. The district selects projects based on three main criteria. The criteria are, cost effectiveness of reducing nitrogen oxides; achievement of the state environmental justice requirement of distributing at least 50 percent of the Carl Moyer Program funds in those areas with the more significant exposure to air contaminants; and a 25 percent or greater reduction in particulate matter.

BAAQMD has provided Carl Moyer Program incentive funds to pay for 108 engines that operate in the District. These engines include on-road and off-road vehicles. But, the District has given the majority of its grants to marine vessels because of the cost-effectiveness of the projects. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 541 tons of NO_x and 32 tons of PM reductions annually for the life of the projects. Overall, the average cost effectiveness for the District's program is about $1,448/ton of NO_x reduced. Table A-5 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-5
BAAQMD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	0	0	0	0	1	0	0	$ 0	$ 322
Other	0	0	0	0	0	3	0	0	0	51,000
Off-Road										
Agriculture	0	0	0	0	0	2	0	0	0	27,305
Construction	0	0	0	0	0	2	0	0	0	46,341
Locomotives	2	0	0	0	0	0	0	0	820,000	0
Marine Vessels	0	32	0	14	0	51	0	0	0	7,598,119
Totals	2	32	0	14	0	60	0	0	$820,000	$7,723,087

Butte County Air Quality Management District (BCAQMD)

Butte County AQMD has participated in the Carl Moyer Program since the second year (FY 1999-2000). In its three years of participation, BCAQMD has received a total of $329,592, which it has matched with $124,516 in district funds. In the fifth year of the Carl Moyer Program, BCAQMD received $100,000 in Proposition 40 funding and was granted a waiver of the match requirement. To date, the BCAQMD has obligated all Carl Moyer Program funds for previous years.

In June 2003, the District released a Request for Projects. It advertised in local newspapers and through local agricultural groups, distributed more than 50 applications, and received over 20 that met program requirements. For the fifth year, the District has issued eleven contracts, ten for agricultural pumps and one for an off-road engine project. It anticipates that all projects will be completed and funded by the end of June 2004.

BCAQMD has provided Carl Moyer Program incentive funds to pay for 35 engines that operate in the district. These engines include the repowering of on- and off-road engines and agricultural pumps. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 22 tons of NO_x and 1.4 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost effectiveness for the district's program is about $2,588/ton of NO_x reduced. Table A-6 list the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-6
BCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Other	---	---	0	0	0	1	0	1	$ 0	$ 19,144
Off-Road										
Agriculture	---	---	0	0	0	2	0	2	0	17,582
Construction	---	---	0	0	0	1	0	0	0	18,225
Ag Pumps	---	---	0	6	0	15	0	7	0	274,554
Totals	---	---	0	6	0	19	0	10	$ 0	$329,505

Colusa County Air Pollution Control District (CCAPCD)

Colusa County APCD has participated in the Carl Moyer Program since the fourth year (FY 2001-2002). In one year of participation in the program, CCAPCD received a total of $75,000, which it matched with $37,500 in district funds. In the fifth year of the Carl Moyer Program, CCAPCD received $100,000 and was granted a waiver of the match requirement. To date, CCAPCD has obligated all Carl Moyer Program funds for the previous year.

The District chooses projects based on emission reductions, feasibility, general environmental impacts, and cost effectiveness. In its first year, the demand for funding was more than twice the District's allocation.

CCAPCD has provided Carl Moyer Program incentive funds to pay for 11 engines that operate in the District. All of these engines were repowers of agricultural pumps. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 4 tons of NO_x and 0.2 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $2,900/ton of NO_x reduced. Table A-7 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-7
CCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
Ag Pumps	---	---	---	---	---	---	0	11	$ 0	$75,000
Totals	---	---	---	---	---	---	0	11	$ 0	$75,000

Feather River Air Quality Management District (FRAQMD)

Feather River AQMD has participated in the Carl Moyer Program since the second year (FY 1999-2000). In its three years of participation in the program, FRAQMD received a total of $320,851, which it matched with $109,326 in district funds. In the fifth year of the Carl Moyer Program, FRAQMD received $100,000 and was granted a waiver of the match requirement. To date, the FRAQMD has obligated all Carl Moyer program funds for previous years.

The district is currently focusing its Carl Moyer program funding on repowering agricultural pumps. It chooses projects on a first-come-first-served basis.

FRAQMD has provided Carl Moyer Program incentive funds to pay for 44 engines that operate in the district. These engines include agricultural pumps, on-road line haul trucks, and various off-road tractors and equipment. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 31 tons of NO_x and 1.7 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $2,161/ton of NO_x reduced. Table A-8 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-8
FRAQMD's Carl Moyer Program-Funded Engines

Source	Year 1		Year 2		Year 3		Year 4		Funds Total	
Category/ Equipment Type	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	---	---	0	0	0	1	0	0	$ 0	$ 11,063
Off-Road										
Agriculture	---	---	0	1	0	8	0	0	0	59,068
Ag Pumps	---	---	0	6	0	18	0	10	0	250,720
Totals	---	---	0	7	0	27	0	10	$ 0	$320,851

Glenn County Air Pollution Control District (GCAPCD)

Glenn County APCD has participated in the Carl Moyer Program since its inception. Over the four years of the program, GCAPCD received $378,743, which it has matched with $155,242 in district funds. In the fifth year of the Carl Moyer Program, GCAPCD received $100,000 and was granted a waiver of the match requirement. To date, GCAPCD has obligated all Carl Moyer Program funds for years one, through three, and approximately 33 percent of the funds for year four.

GCAPCD has provided Carl Moyer Program incentive funds to pay for 50 engines that operate in the district. These engines include agricultural pump, agricultural tractors, and an alternatively fueled delivery truck. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 38 tons of NO_x and 2.1 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost effectiveness of the district's program is about $1,652/ton of NO_x reduced. Table A-9 list the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-9
GCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
Ag Pumps	0	14	0	9	0	23	0	4	0	$322,040
Totals	0	14	0	9	0	23	0	4		$322,040

Imperial County Air Pollution Control District (ICAPCD)

Imperial County APCD has participated in Carl Moyer Program since its inception. In the first four years of the Program, ICAPCD has received $456,543 that it matched with $187,491 in district funds. In the fifth year of the Carl Moyer Program, ICAPCD received $100,000 and was granted a waiver of the match requirement. To date, the ICAPCD has obligated all Carl Moyer Program funds for previous years.

The District distributes applications through the Agricultural Commissioner's Office, the Farm Bureau, and through a direct mailing and distribution effort. The types of industries notified include firms with agricultural and earthmoving equipment, on-road equipment operators, farmers, trucking companies, hay processors, and agricultural irrigation pump operators. ICAPCD accepts applications on a first-come-first-served basis and conducts evaluations based on cost-effectiveness.

ICAPCD has provided Carl Moyer Program incentive funds to pay for 39 engines that operate in the District. These engines were all agricultural irrigation pumps. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 35 tons of NO_x and 1.4 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness for the District's program is about $1,661/ton of NO_x reduced. Table A-10 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-10
ICAPCD's Carl Moyer Program-Funded Engines

	Year 1		Year 2		Year 3		Year 4		Funds Total	
Source Category/ Equipment Type	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**
Ag Pumps	0	13	0	7	0	13	0	6	0	$454,800
Totals	0	13	0	7	0	13	0	6	$ 0	$454,800

Kern County Air Pollution Control District (KCAPCD)

Kern County APCD participated in the Carl Moyer Program in the second and fifth years. In the second year of the program, KCAPCD received a total of $100,000, which it has matched with $50,000 in district funds. In the fifth year of the Carl Moyer Program, KCAPCD received $100,000 and was granted a waiver of the match requirement. To date, the KCAPCD has obligated all Carl Moyer funds from its previous years of participation.

The District was allocated $225,000 in year two and $325,000 in year three funds. However, KCAPCD used only $100,000 of the second year funds to pay for engines that the District selected and elected not to participate in the third year. The $450,000 that KCAPCD declined was reallocated in ARB's 2001 inter-district solicitation. The District has allocated all of its fifth year funds with three agricultural pump projects and the replacement of a front-end loader diesel engine.

KCAPCD has provided Carl Moyer Program incentive funds to payfor 8 engines that operate in the district. These engines were all agricultural pumps. The staff of ARB estimates that Carl Moyer Program funds obligated by the District will provide approximately 25 tons of NO_x annually for the life of the projects. Overall, the average cost-effectiveness of the District's program is about $760/ton of NO_x reduced. Table A-11 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-11
KCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
Ag Pumps	---	---	8	0	---	---	---	---	$99,229	$ 0
Totals	---	---	8	0	---	---	---	---	$99,229	$ 0

Mendocino County Air Quality Management District (MCAQMD)

Mendocino County AQMD began participating in the second year of the program. MCAQMD received $287,018 in the second, third and fourth years of the program, which it matched with $109,326. In the fifth year of the Carl Moyer Program, MCAQMD received $100,000 and was granted a waiver of the match requirement. The District has obligated all Carl Moyer Program funds from previous years.

MCAQMD is currently accepting applications for fifth year funds and expects to approve projects for funding in January 2004. For the fifth year, Lake County Air Quality Management District (LCAQMD) has entered into a contract with MCAQMD to manage and administer LCAQMD's Carl Moyer Program.

MCAQMD has provided Carl Moyer Program incentive funds to pay for 15 engines that operate in the District. These engines include on-road, off-road, agricultural pumps and marine vessel diesel engines. The lack of natural gas pipelines in most of the county significantly reduces the opportunity for alternative fuel projects. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 16 tons of NO_x and 0.1 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $2,667/ton of NO_x reduced. Table A-12 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-12
MCAQMD's Carl Moyer Program-Funded Engines

	Year 1		Year 2		Year 3		Year 4		Funds Total	
Source Category/ Equipment Type	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**
On-Road										
Line Haul	---	---	0	2	0	0	0	0	$ 0	$ 33,315
Other	---	---	0	2	0	1	0	0	0	36,871
Off-Road										
Other	---	---	0	1	0	0	0	0	0	10,000
Ag Pumps	---	---	0	1	0	3	0	1	0	50.324
Marine Vessels	---	---	0	1	0	3	0	0	0	136,323
Totals	---	---	0	7	0	7	0	1	$ 0	$266,833

Mojave Desert Air Quality Management District (MDAQMD)

Mojave Desert AQMD participated in the first three years and the fifth year of the Carl Moyer Program. During the first three years, the MDAQMD received a total of $3,016,999 in state funding, which it matched with $1,158,507 in district funds. In the fifth year if the Carl Moyer Program, MDAQMD received $100,000 and was granted a waiver of the match requirements. To date, the MDAQMD has obligated 78 percent of its Carl Moyer Program funds. The district is currently pursuing projects to obligate the remaining funds.

The District has funded proposals from the following organizations: fuel distributors/utilities, railroad industry, transit agencies, school districts, alternative fuel vehicle/engine providers/associations, public/private fleets, commercial delivery/distributions/associations, consultants, construction, Chambers of Commerce, waste haulers, manufacturing facilities, and military facilities.

MDAQMD's process for selecting projects is based on the total dollar amount of funding requests received in the first five business days following the release of the district's request for proposals. If the total funding requests exceed the money available, projects are reviewed and selected on a competitive basis. In the fifth year, the Mobile Source Reduction Committee will make recommendations for funding to the Governing Board for approval which is expected by December 29, 2003.

MDAQMD has provided Carl Moyer Program incentive funds to pay for 67 engines that operate in the district. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 69 tons of NO_x and 5.5 tons of PM_{10} reductions annually for the life of the projects. Overall, the average cost effectiveness for the district's program is about $5,406/ton of NO_x reduced. Table A-13 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-13
MDAQMD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	0	6	0	20	0	---	---	$ 790,882	$ 0
Refuse Hauler	21	0	0	0	0	0	---	---	679,998	0
Other	0	0	6	0	0	0	---	---	129,890	0
Off-Road										
Construction	0	0	0	1	0	0	---	---	0	6,678
Other	0	0	0	5	0	7	---	---	0	709,377
Ag Pumps	0	0	0	0	0	1	---	---	0	22,660
Totals	21	0	12	6	20	8	---	---	$1,600,770	$738,715

Monterey Bay Unified Air Pollution Control District (MBUAPCD)

Monterey Bay Unified APCD has participated in the Carl Moyer Program since its inception. Over the four years of the program, MBUAPCD has received a total of $1,078,536, which it has matched with $375,032 in district funds. In the fifth year of the Carl Moyer Program, MBUQPCD received $293,779 in state funding and matched $146,890. To date, MBUAPCD has obligated 76 percent of its Carl Moyer Program funds for previous years.

The District traditionally separated its funds into three amounts. This allowed each of the three counties under MBUAPCD's jurisdiction to benefit from projects paid for under the program. These counties include Monterey, Santa Cruz, and San Benito. Funding amounts were determined using the population in each of these counties. Projects were selected on a first-come-first-served basis. MBUAPCD has already issued an RFP for the fifth year of the program.

MBUAPCD has provided Carl Moyer Program incentive funds to pay for 47 engines that operate in the District. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 33 tons of NO_x and 2.5 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $4,879 per ton of NO_x reduced. Table A-14 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-14
MBUAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Transit Bus	8	0	0	0	0	0	0	0	$ 265,799	$ 0
Off-Road										
Construction	0	0	0	0	0	1	0	1	0	66,282
Ag Pumps	0	0	0	0	0	3	0	15	0	231,141
Marine Vessels	0	0	0	5	0	14	0	0	0	$ 515,093
Totals	8	0	0	5	0	18	0	16	$ 265,799	$812,517

North Coast Unified Air Quality Management District (NCUAQMD)

North Coast UAQMD has participated in the Carl Moyer Program since its inception. Over the four years of the program, NCUAQMD received a total of $424,082, which it matched with $171,722 in district funds. In the fifth year of the Carl Moyer Program, NCUAPCD received $100,000 and was granted a waiver of the match requirement. To date, NCUAQMD has obligated all Carl Moyer Program funds for previous years.

The district accepts applications on a first-come-first-served basis with competitive grouping. The district's timeline for its fifth year funds is to accept applications beginning in October 2003, have contracts executed in December 2003, and projects completed in March 2004.

NCUAPCD has provided Carl Moyer Program incentive funds to pay for 25 engines that operate in the district. These engines include six off-road, 16 on-road, and three marine vessel repowers. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 33 tons of NO_x and 1.6 tons of PM_{10} reductions annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $3,957/ton of NO_x reduced. Table A-15 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-15
NCUAQMD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	2	0	0	0	1	0	2	$ 0	$ 67,978
Other	0	4	0	2	0	5	0	0	0	204,332
Off-Road										
Construction	0	0	0	0	0	0	0	1	0	22,500
Other	0	3	0	0	0	2	0	0	0	58,738
Marine Vessels	0	1	0	1	0	0	0	1	0	70,534
Totals	0	10	0	3	0	8	0	4	$ 0	$424,082

Northern Sierra Air Quality Management District (NSAQMD)

Northern Sierra AQMD has participated in the Carl Moyer Program since its inception. Over the four years of the program, NSAQMD received a total of $432,142, which it matched with $175,791 in district funds. In the fifth year of the Carl Moyer Program, NSAQMD received $100,000 and was granted a waiver of the match requirement. To date, NSAQMD has obligated 77 percent of its Carl Moyer funds from previous years.

The District's outreach efforts include news releases, mailings, and radio advertisements. The District accepts applications on a first-come-first-served basis. In the event that proposals submitted on the same day meet the minimum qualifications, and there are insufficient funds available for all proposals, cost effectiveness for NO_x is used to determine the projects to be funded. Fifth year funds will be administered in the same way as previous phases. The one significant change in the fifth year is that the program will be offered district wide. In the past, the program was only offered in western Nevada County due to match requirements.

NSAQMD has provided Carl Moyer Program incentive funds to pay for 19 engines that operate in the district. These engines include on- and off-road projects. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 12 tons of NO_x and 2.2 tons of PM_{10} reductions annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $4,739/ton of NO_x reduced. Table A-16 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-16
NSAQMD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	0	0	1	0	4	0	0	$ 0	$ 146,569
Transit Bus	0	0	1	0	0	0	0	0	9,065	0
Other	0	7	0	2	0	1	0	0	0	132,099
Off-Road										
Construction	0	2	0	0	0	0	0	0	0	34,000
Other	0	0	0	0	0	0	0	1	0	12,591
Totals	0	9	1	3	0	5	0	1	$ 9,065	$ 325,259

Northern Sonoma County Air Pollution Control District (NSCAPCD)

Northern Sonoma County APCD has participated in the Carl Moyer Program during the first, third, and fourth years. In three years of participation in the program, NSCAPCD received a total of $338,900, which it has matched with $135,267 in district funds. In the fifth year of the Carl Moyer Program, NSCAPCD received $100,000 and was granted a waiver of the match requirement. To date, the NSCAPCD has obligated 73 percent of its Carl Moyer Program funds from previous years.

The District solicits applications through a Request for Proposal (RFP), targeting agricultural industries, farms, transportation associations, school districts, and government agencies. In the fifth year of the program, the District sent out approximately 100 copies of the RFP. The District has received several inquiries and anticipates receiving a number of completed applications before the end of the year.

NSCAPCD has provided Carl Moyer Program incentive funds to pay for 27 engines that operate in the District. These engines include marine vessels, and CNG school and urban transit buses. The staff of ARB estimates that Carl Moyer Program funds obligated by the District will provide approximately 15 NO_x tons and 0.5 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness for the district's program is about $2,060/ton of NO_x reduced. Table A-17 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-17
NSCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Transit Bus	7	0	---	---	8	0	0	0	$116,660	$ 0
School Bus	0	0	---	---	7	0	0	0	50,000	0
Marine Vessels	0	2	---	---	0	2	0	1	0	80,000
Totals	7	2	---	---	15	2	0	1	$166,660	$80,000

Sacramento Metropolitan Air Quality Management District (SMAQMD)

Sacramento Metropolitan AQMD has participated in the Carl Moyer Program since its inception. Over the four years of the Program, SMAQMD received $8,953,381, which it has matched with $3,585,727 in district funding. In the fifth year of the Carl Moyer Program, SMAQMD received $1,981,316 and will provide $990,658 in matching funds. To date, SMAQMD has obligated all Carl Moyer Program funds for previous years.

The District has incorporated the Carl Moyer Program into the District's on-going heavy-duty incentive program. The District's program is designed to select the most cost-effective projects to yield the greatest NO_x reductions to meet Sacramento's much-needed conformity and air quality plans. SMAQMD initially received $1.3 million in eligible applications for year five. The District will begin the obligation of these funds in November 2003 and complete these projects by May of 2004. Obligation of the remaining funds will be completed by June 2004.

SMAQMD has provided Carl Moyer Program incentive funds to pay for 862 engines that operate in the District. The vast majority of these engines were agricultural irrigation pumps and off-road equipment. The district also funded some on-road school buses and locomotive idle reduction projects. This funding pattern will continue in the fifth year with renewed emphasis in school bus projects. The staff of ARB estimate that Carl Moyer Program funds obligated by the District will provide approximately 474 tons of NO_x, and 19 tons of PM_{10} reductions annually over the life of the projects. Overall, the average cost-effectiveness for the District's program is about $4,742/ton of NO_x reduced. Table A-18 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-18
SMAQMD's Carl Moyer Program-Funded Engines

	Year 1		Year 2		Year 3		Year 4		Funds Total	
Source Category/ Equipment Type	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**
On-Road										
Line Haul	0	0	0	0	0	0	1	0	$ 6,123	$ 0
School Bus	4	0	0	0	1	0	0	0	155,911	0
Other	0	0	0	0	0	0	2	0	26,800	0
Off-Road										
Agriculture	0	0	0	9	1	25	0	11	2,800	554,817
Construction	0	0	0	3	0	29	0	19	0	1,122,801
Other	0	0	0	0	0	4	2	1	7,540	60,657
Ag Pumps	0	200	0	162	8	310	0	48	214,307	6,474,622
Marine Vessels	0	0	0	0	0	0	0	1	0	15,000
Locomotives	0	0	0	0	0	0	0	21	0	299,985
Totals	4	200	0	174	10	368	5	101	$413,481	$ 8,527,882

San Diego County Air Pollution Control District (SDCAPCD)

San Diego County APCD has participated in the Carl Moyer Program since its inception. In its four years of participation in the program, SDCAPCD received $4,459,650, which it has matched with $1,804,148 in district funds. In the fifth year of the Carl Moyer Program, SDCAPCD received $867,328 and will provide $433,664 in matching funds. To date, SDCAPCD has obligated all Carl Moyer Program funds for previous years.

The District releases an RFP to a mailing list of nearly 500 interested applicants (companies, agencies and individuals). A notice is also placed in the major local papers. Applications are evaluated and ranked together in order of cost-effectiveness. That ranked list of projects is recommended to the District's Board, and they allocate funding in rank (cost-effectiveness) order.

SDCAPCD has provided Carl Moyer Program funds to pay for 158 engines that operate in the District. These engines include the purchase of new alternative fuel urban transit buses, school buses, and waste haulers, along with the repowering of diesel marine vessels with cleaner engines. While the early transit projects were alternative fuels, recent cycles have been almost exclusively diesel repowers. This has allowed the district to reach a segment of the inventory that has significant long-term emissions and has traditionally been one of the last sectors to reduce emissions. The staff of ARB estimates that Carl Moyer Program funding obligated by the District will provide approximately 138 tons of NO_x and 9.7 tons of PM_{10} annually during the life of the projects. Overall, the average cost-effectiveness of the District's program is about $3,125/ton of NO_x reduced. Table A-19 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-19
SDCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	0	0	0	0	1	0	3	$ 0	$ 80,557
Refuse Hauler	0	0	9	0	0	0	0	0	182,236	0
Transit Bus	16	0	50	0	0	0	0	0	677,920	0
School Bus	8	0	0	0	0	0	0	0	195,640	0
Other	0	0	0	0	0	15	0	0	0	396,222
Off-Road										
Construction	0	0	0	0	0	0	0	5	0	407,446
Marine Vessels	0	16	0	5	0	20	0	10	0	1,975,155
Totals	24	16	59	5	0	36	0	18	$1,055,796	$2,859,380

San Joaquin Valley Air Pollution Control District (SJVAPCD)

San Joaquin Valley APCD has participated in the Carl Moyer Program since its inception. Over the first four years of the Carl Moyer Program, SJVAPCD received $17,989,495 in State funding, which it matched with $7,252,524 in district funds. In the fifth year of the Carl Moyer Program, SJVAPCD received $3,187,325, and will provide $1,593,663 in matching funds. To date, the SJVAPCD has obligated all Carl Moyer Program (CMP) funds for years one, two, and three, and approximately 30 percent of the funds for year four. The District anticipates that all year four funds will be allocated by the end of 2003. Interest in the program remains high—currently the district has received applications totaling approximately $25 million and has a waiting list of applicants.

The district selects projects based on three main criteria. The criteria are, first-come-first-served; achievement of the state environmental justice requirement of distributing at least 50 percent of the CMP funds in those areas with the more significant exposure to air contaminants; and, a 25 percent or greater reduction in particulate matter. Using these criteria, SJVAPCD has provided CMP incentive funds for projects including agricultural pump engines, refuse haulers, street sweepers, tractors, grape harvesters, delivery trucks, and almond sweepers.

SJVAPCD has provided Carl Moyer Program incentive funds to pay for about 1,280 engines that operate in the district. The staff at ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 1,324 tons of NO_x and 77.7 tons of PM_{10} reductions annually for the life of the projects. Overall, the average cost effectiveness for the district's program is about $1,991 per ton of NO_x reduced. Table A-20 list the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-20
SJVAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	29	0	0	0	0	0	0	$ 0	$ 712,950
Refuse Hauler	0	6	0	0	0	0	0	0	0	112,000
Other	3	1	0	0	0	0	0	0	0	47,867
Off-Road										
Agriculture	0	5	0	17	0	2	0	0	0	201,276
Other	0	2	0	0	0	0	0	0	0	50,000
Ag Pumps	12	306	2	240	9	568	4	74	566,551	13,667,093
Totals	15	349	2	257	9	570	4	74	$566,551	$14,791,186

San Luis Obispo County Air Pollution Control District (SLOCAPCD)

San Luis Obispo County APCD has participated in the Carl Moyer Program since its inception. In the four years of the program, SLOCAPCD received a total of $492,746, which it matched with $213,207 in district funds. In the fifth year of the Carl Moyer Program, SLOCAPCD received $100,000 and was granted a waiver of the match requirement. To date, SLOCAPCD has obligated all Carl Moyer funds for years one, two and three. The District will complete obligation of year four funds by June 2004.

The District allocated all its funds to the Hearst Castle Historical Monument in the first year of the program. The Carl Moyer Program funding helped to replace 15 full size diesel buses and a diesel para-transit bus with a new fleet of CNG buses. In the following years, including year five, SLOCAPCD issued a request for proposals and accepted applications on a first-come first-served basis. SLOCAPCD has issued a request for proposals for its allocation of fifth year funds.

SLOCAPCD has provided Carl Moyer Program incentive funds to pay for 31 engines that operate in the District. Besides the alternative fuel buses funded in the first year, funded engines include repowers of marine vessels, agricultural pumps, on-road vehicles and off-road equipment. The staff of ARB estimates that Carl Moyer funds obligated by the District will provide approximately 15 tons of NO_x and 0.9 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness for the District's program is about $4,263/ton of NO_x reduced. Table A-21 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-21
SLOCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Transit Bus	15	0	0	0	0	0	0	0	$157,800	$ 0
Other	0	0	0	0	0	2	0	2	0	55,467
Off-Road										
Construction	0	0	0	0	0	0	0	1	0	6,613
Ag Pumps	0	0	0	2	0	0	0	2	0	28,045
Marine Vessels	0	0	0	4	0	3	0	0	0	212,037
Totals	15	0	0	6	0	5	0	5	$157,800	$302,162

Santa Barbara County Air Pollution Control District (SBCAPCD)

Santa Barbara County APCD has participated in the Carl Moyer Program since its inception. Over the four years of the Program, SBCAPCD received a total of $1,187,720, which it has matched $491,309 in district funds. In the fifth year of the Carl Moyer Program, SBCAPCD received $208,902 and will provide $104,451 in matching funds. To date, the SBCAPCD has obligated all of their Carl Moyer Program funds for previous years.

The SBCAPCD solicits applicants using a number of methods including web site broadcasts, flyers, mail-outs, and announcements at trade association meetings. Project selection is based on a combination of first-come-first-served and cost-effectiveness.

SBCAPCD has provided Carl Moyer Program incentive funds to pay for 46 engines that operate in the District. These engines include marine vessel repowers, agricultural pump engines, and on-road projects such as the Clean Air Express Commuter Bus CNG Repower Project. The staff of ARB estimate that Carl Moyer Program funds obligated by the District will provide approximately 43 tons of NO_x and 2.8 tons of PM_{10} reductions annually for the life of the projects. Overall, the average cost-effectiveness for the District's program is about $4,173/ton of NO_x reduced. Table A-22 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-22
SBCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Refuse Hauler	0	0	0	0	0	3	0	5	$ 0	$202,529
Transit Bus	3	0	1	1	0	0	0	0	169,749	50,868
Other	0	0	0	0	1	1	0	0	7,000	18,945
Ag Pumps	0	0	0	0	4	6	6	1	213,180	120,015
Marine Vessels	0	5	0	4	0	5	0	0	0	393,543
Totals	3	5	1	5	5	15	6	6	$389,929	$785,900

Shasta County Air Quality Management District (Shasta County AQMD)

Shasta County AQMD has participated in the second, third, and fourth years of the Carl Moyer program. In its three years of participation Shasta County received a total of $324,727, which it matched with $122,083 in district funds. Shasta County is not participating in the fifth year of the Carl Moyer Program. To date, the Shasta County has obligated almost all Carl Moyer Program funds for years two and three. A staff shortage has prevented Shasta County from obligating its fourth year funds.

The District solicited project applicants through local newspapers, mailings, and through engine and equipment dealers. The district was even successful in having their program featured in the local news. Shasta County combined a portion of their second and third year funds in an effort to fully fund the most cost-effective projects

Shasta County has provided Carl Moyer Program incentive funds to pay for 20 engines that operate in the District. These engines include on-road, off-road and agricultural pump projects. The staff of ARB estimates that Carl Moyer Program funds obligated by the District will provide approximately 32 tons of NO_x reductions annually for the life of the projects. Overall, the average cost-effectiveness for the District's program is about $1,382/ton of NO_x reduced. Table A-23 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-23
Shasta County AQMD's Carl Moyer Program-Funded Engines

	Year1		Year 2		Year 3		Year 4		Funds Total	
Source Category/ Equipment Type	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**	**Alt Fuel**	**Diesel**
On-Road										
Line Haul	---	---	0	1	0	1	---	---	$ 0	$ 28,500
Other	---	---	0	0	0	8	---	---	0	103,698
Off-Road										
Agriculture	---	---	0	0	0	3	---	---	0	27,562
Construction	---	---	0	3	0	2	---	---	0	55,271
Ag Pumps	---	---	0	1	0	1	---	---	0	29,449
Totals	---	---	0	5	0	15	---	---	$ 0	$244,480

South Coast Air Quality Management District (SCAQMD)

SCAQMD has participated in the Carl Moyer Program since its inception. Over the four years of the Program, SCAQMD received a total of $46,426,773, which it matched with more than $18,713,482 in district funds. In the fifth year of the Carl Moyer Program, SCAQMD received $8,148,088 and will provide $4,074,044 in matching funds. To date, the SCAQMD has obligated approximately 94% of their Carl Moyer Program funds for previous years.

The SCAQMD program announcement has been sent to more than 15,000 businesses, government agencies, and interested industries annually. Criteria for selecting projects are based on the current Carl Moyer Program Guidelines, with priority given to alternative fuel projects. The amount of CMP funding spent in the first four years of the program totaled about $43.6 million. The SCAQMD closed its RFP process on October 10, 2003 to select projects under the fifth year program. They received over $69 million in proposals.

SCAQMD has provided Carl Moyer Program incentive funds to pay for 1,860 engines that operate in the district. Some of the project participants that received funds in the South Coast during the first four years include Waste Management, Burrtec Waste Industries, Sunline, Omnitrans, Norco Egg Ranch, Los Angeles County Metropolitan Transit Authority, Lucky Stores, Marine Terminals, Homebase, Lowe's HIW, Avery-Dennison, and Harbor Distributors. The staff of ARB estimates that Carl Moyer Program funds obligated by the district will provide approximately 1,553 tons of NO_x and 58 tons of PM_{10} reduction annually for the life of the projects. Overall, the average cost-effectiveness of the district's program is about $3,334/ton of NO_x reduced. Table A-24 lists the types of projects paid for with funds received from the ARB, the number of engines funded, and an estimate of funds obligated by project category.

Table A-24
SCAQMD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	0	0	0	0	10	0	45	0	$ 2,765,000	$ 0
Refuse Hauler	86	0	78	0	256	22	160	0	17,100,131	343,801
Transit Bus	117	0	133	0	192	1	231	0	9,935,479	23,450
Other	0	0	0	0	79	1	86	0	3,204,720	6,500
Off-Road										
Construction	0	0	0	1	0	0	0	33	0	2,652,300
Other	12	0	23	0	0	0	1	0	1,264,200	0
Ag Pumps	0	0	3	0	0	0	0	0	48,300	0
Forklifts	105	0	0	0	103	0	3	0	1,904,403	0
Marine Vessels	0	6	0	0	0	0	0	35	0	4,219,610
APU	0	0	0	0	0	0	0	38	0	114,000
Totals	320	6	237	1	640	24	526	106	$36,222,232	$7,359,661

Tehama County Air Pollution Control District (TCAPCD)

TCAPCD has participated in the Carl Moyer Program since the third year (FY 2000-2001). In its first two years of participation in the Program, TCAPCD received a total of $225,000, which it has matched with $78,317 in district funds. In the fifth year of the Carl Moyer Program, TCAPCD received $100,000 and was granted a waiver of the match requirement. Even with the match waiver, TCAPCD's Board approved the use of $60,000 of DMV monies to be used for Carl Moyer Program eligible projects. To date the TCAPCD has obligated all Carl Moyer Program funds for previous years.

The District is in a predominantly agricultural area. Therefore, the District focuses its out reach efforts on the agriculture industry. The majority of TCAPCD's applications are for agricultural pump repowers. TCAPCD accepts applications on a first-come first-serve basis. The district began receiving completed applications for fifth year funds on July 15, 2003. Applications received for fifth year funds totaled $277,832, triple the amount of Carl Moyer funds allocated to TCAPCD.

TCAPCD has provided Carl Moyer Program incentive funds to pay for 26 engines that operate in the District. These include 24 agricultural pump repowers, one on-road engine and one off-road engine. The staff of ARB estimates that the Carl Moyer Program funds obligated by the District will provide approximately 26 tons of NO_x and 1.3 tons of PM_{10} reductions annually for the life of the projects. Overall, the average cost effectiveness for the District's program is about $1,504/ton of NO_x reduced. Table A-25 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-25
TCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Other	---	---	---	---	0	1	0	0	$ 0	$ 2,270
Off-Road										
Agriculture	---	---	---	---	0	1	0	0	0	3,600
Ag Pumps	---	---	---	---	0	16	0	8	0	219,015
Totals	**---**	**---**	**---**	**---**	**0**	**18**	**0**	**8**	**$ 0**	**$224,885**

Ventura County Air Pollution Control District (VCAPCD)

VCAPCD has participated in the Carl Moyer Program since its inception. In the first four years of the program, VCAPCD received $3,655,230, which it matched with $1,475,852. In the fifth year of the Carl Moyer Program, VCAPCD received $728,699 and will provide $364,350 in matching funds. To date, the VCAPCD has obligated all Carl Moyer Program funds for the first four years.

In the fifth year, all except $475,000 have been obligated. VCAPCD received project applications for agricultural pumps, marine vessels, off road repowers and on-road engines. VCAPCD estimated that the funding requests totaled more than $5.5 million, which exceeds the amount of Carl Moyer Program funds that the state allocated to VCAPCD to implement its program over five years. Since the District's Board gives priority to alternative fuel projects, the remaining $475,000 is currently reserved for a potential alternative fuel project. The District used most of its matching funds to provide alternative fuel infrastructure to service the alternative fuel vehicles.

VCAPCD has provided Carl Moyer Program incentive funds to pay for 128 engines that operate in the District. These engines include alternative fuel refuse haulers and street sweepers; diesel to diesel agricultural irrigation pumps repowers; diesel to diesel marine vessels main propulsion and auxiliary engines; and an off road equipment repower. The staff of ARB estimates that Carl Moyer Program funds obligated by the District will provide approximately 103 tons of NO_x and 10.7 tons of PM_{10} reduction annually, for the life of the projects. Overall, the average cost effectiveness for the district's program is about $3,618/ton of NO_x reduced. Table A-23 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-26
VCAPCD's Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Refuse Hauler	8	0	8	0	21	0	5	0	$1,597,315	$ 0
Other	0	0	2	0	0	1	0	1	18,440	67,030
Ag Pumps	0	4	0	0	0	4	0	5	0	122,173
Marine Vessels	0	20	0	12	0	24	0	13	0	1,850,273
Totals	8	24	10	12	21	29	5	19	$1,615,755	$2,039,476

Inter-District Projects

ARB has the authority [Health and Safety Code Section 44286 (d)] to reserve up to ten percent of the Carl Moyer Program funding for qualifying projects that operate in more than one district. In FY 2000-2001 the ARB used that authority to set aside $501,750 for Inter-District Projects.

Outreach was conducted through a statewide solicitation published in December 2001. ARB received applications for eligible projects for three times the amount of available funds. Eligible projects were competitively rated and ranked. Each of the four selected projects was monitored and managed locally by one of the Districts in which the projects were based and operated.

The funded projects included, an on-road line haul project managed by Antelope Valley APCD; a marine repower project (both propulsion and auxiliary engines) managed by Ventura County APCD; and, a marine repower project (both propulsion engines) and an on-road project both managed by South Coast AQMD. The staff of ARB estimates that these Inter-District Projects will result in a total of approximately 24 tons of NO_x and 1 tons of PM_{10} reductions annually for the life of the projects. Overall, the average cost effectiveness of these projects is about $1,772/ton of NO_x reduced. Table A-24 lists the types of projects funded, the number of engines funded, and an estimate of funds obligated by project category.

Table A-27
Inter-District Carl Moyer Program-Funded Engines

Source Category/ Equipment Type	Year 1		Year 2		Year 3		Year 4		Funds Total	
	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel	Alt Fuel	Diesel
On-Road										
Line Haul	---	---	---	---	2	0	---	---	$117,975	$ 0
Other	---	---	---	---	1	0	---	---	19,000	0
Marine Vessels	---	---	---	---	0	6	---	---	0	364,000
Totals	---	---	---	---	2	6	---	---	$136,975	$364,000

New Air Districts

There are eight new air districts that have applied for fifth year Carl Moyer Program funding. The new air districts are:

1) Amador County APCD
2) Calaveras County APCD
3) Lake County AQMD
4) Lassen County APCD
5) Mariposa County APCD
6) Modoc County APCD
7) Siskiyou County APCD, and
8) Tuolumne County APCD

Each of these new air districts have less than one percent of the State's population. As a result, each new district has received the minimum allocation amount of $100,000 for the fifth year. In addition, all of these districts have certified that they have the commitment and resources to implement the program, but have asked for a waiver of the matching funds requirement.

These new districts are in the process of developing their programs, including their outreach efforts, application processes and timetables. These new districts are capitalizing on the knowledge and experience of the districts that have previously participated in the Program. For example, Tuolumne County is developing its local Carl Moyer Program with the technical assistance of neighboring air districts. Another new district, Lake County, is contracting with Mendocino County to manage and administer their Carl Moyer Program funds.

Some of the new districts have already identified the source category they will fund and one has even identified projects. Since these new districts are in less populated areas, many of them anticipate outreaching to sawmill/logging facilities and agricultural/farming entities, as well as government agencies, waste management facilities, and transportation directors, including school districts.

All of the new districts plan to solicit applications and award contracts by the summer of 2004, with project completions starting in fall of 2004.

APPENDIX B

FUELING INFRASTRUCTURE DEMONSTRATION

AND

ADVANCED TECHNOLOGY DEVELOPMENT

Fueling Infrastructure Demonstration and Advanced Technology Development (California Energy Commission Administered Sections)

Sections 44284 and 44285 of the Health and Safety Code direct the California Energy Commission (CEC) to administer the Fueling Infrastructure Demonstration and Advanced Technology Development Sections under the Carl Moyer Program (CMP). CEC received a total of $4.5 and $4.2 million in the 1999-2000 and 2000-2001 fiscal year (FY) budgets for these respective sections. This chapter describes CEC's administration of these sections and the status of the projects.

A. The Infrastructure Demonstration Section

The Infrastructure Demonstration portion of the CMP was designed to provide districts with the means for funding infrastructure to support engine projects, other than standard gasoline or diesel, which would qualify for Carl Moyer vehicle funds. The program guidelines can be obtained on CEC's website at **www.energy.ca.gov**. CEC must solicit applications for a broad mix of fueling and electrification infrastructure projects. The program solicitation is directed to the local air districts. Districts respond to the solicitation with specific project proposals. Funded facilities must dispense a minimum of 14,280 million Btus per year or 4,000 kWh of electricity per charger annually. Vehicles used to meet these thresholds must meet the CMP criteria for vehicles and equipment.

1. Infrastructure Demonstration Status

CEC developed program criteria and guidelines (criteria) for implementing the Carl Moyer Fuel Infrastructure Program. The criteria were released for public review in August 1999 and public workshops were held in San Diego and Sacramento during September 1999. The criteria were approved at a CEC Business Meeting in November 1999. Under the CEC program, funds are distributed to air districts that solicit applications and expend funds in accordance with the criteria. This approach allows districts to coordinate funding for infrastructure that correlates to heavy-duty engine projects also funded under the Carl Moyer Program. CEC allocated $2 million for the Infrastructure Demonstration Section in 1999-2000.

A Program Opportunity Notice (PON) was released to all California air districts in November 1999, but was canceled in March 2000, because of a lack of qualifying proposals representing critical, non-attainment air quality areas in California. A second PON was reissued in March 2000, and awards for fueling infrastructure totaling $2 million were made to eight qualifying districts. Those qualifying districts and the amount of funds requested and received are listed in Table V-1, below.

Table V-1
Infrastructure Funding Requests and Allocations
1999-2000

Applicant	Funding Requested	Funding Received
SCAQMD	$2,522,000	$ 900,000
SJVAPCD	$ 700,000	$ 350,000
BAAQMD	$ 200,000	$ 200,000
SMAQMD	$ 200,000	$ 150,000
SDCAPCD	$ 100,000	$ 100,000
VCAPCD	$ 200,000	$ 100,000
AVAPCD	$ 100,000	$ 100,000
MDAQMD	$ 100,000	$ 100,000
Total	**$4,122,000**	**$2,000,000**

When completed, these fuel sites will furnish compressed natural gas (CNG), and liquefied natural gas (LNG) to more than 160 new Moyer-qualified trucks and dispense more than 304,000 million Btus of fuel annually. It is estimated that the projects proposed for funding will reduce oxides of nitrogen (NOx) emissions annually by over 169 tons. Table V-2 lists the applicants in each district, number of vehicles per site, total Btu's dispensed, and estimated NOx reductions.

The $2 million was committed to support infrastructure implementation in 1999-2000, which was matched with more than $7 million from project participants. This means that every dollar of state funding was matched by over three dollars from program participants.

Table V-2
Infrastructure Projects
1999-2000

Air District	Site	Trucks	Fuel	NOx [a]	Btu [b]	CEC	Cost Share
SCAQMD						$ 900,000	$1,500,000
	Pickens/Waste Mgt LA	20	CNG	93	90,072		
	Pickens/Waste Mgt San Gabriel	20	CNG	93	30,024		
	Pickens/USA Biomass	20	CNG	131	44,671		
	Pickens/Calmet	27	CNG	229	35,466		
	Pickens/Sunline Trans.	10	LNG	47	30,024		
	Burrtec/Riverside		LNG				
SJVAPCD	Waste Management Fresno	9	LNG	41	14,900	$ 259,000	$ 855,363
BAAQMD	Sunnyvale, City of	24	CNG	23	16,329	$ 200,000	$4,900,000
SMAQMD	City of Sacramento	50[c]	L/CNG	12	30,412	$ 200,000	$ 400,000
SDCAPCD	Oceanside USD	29	CNG	12	14,300	$ 100,000	$ 275,000
VCAPCD	GI Rubbish	14	LNG	52	18,639	$ 100,000	$ 300,000
AVAPCD	Waste Management	14	LNG	91	16,058	$ 100,000	$ 425,111
MDAQMD	City of Victorville		CNG		36,500	$ 100,000	$ 255,000
Total		**164**		**826**	**317,783**	**$1,759,000**	**$8,910,474**

a. NOx reduction over life of project
b. Projected million Btus to be consumed annually
c. Includes 20 School Buses

Under the third year of the CMP, CEC allocated $2.5 million to pay for infrastructure demonstration projects. CEC issued a PON in October 2000, with proposals due December 1, 2000. CEC received a total of about $5,289,000 in funding requests for infrastructure. CEC awards for seven local air districts were approved in March 2001. Districts are currently in the process of finalizing agreements with applicants who have qualified for funds. The awarded districts and funding amounts are listed below in Table V-3.

Table V-3
Infrastructure Program Awards
2000-2001

District	Funding Amounts
SCAQMD	$1,188,710
SJVAPCD	$ 450,000
BAAQMD	$ 250,000
SMAQMD	$ 216,130
VCAPCD	$ 135,080
Shasta County AQMD	$ 135,080
MDAQMD	$ 125,000
TOTAL	**$2,500,000**

Table V-4
Infrastructure Projects
2000-2001

Air District	Site	Trucks	Fuel	CEC	Cost Share
BAAQMD	Waste Management Alameda County	16	LNG	$ 250,000	$ 331,412
VCAPCD	Harrison Industries	10	LNG	$ 135,080	$ 700,000
SJVUAPCD	Southwest Trans.	19	LNG	$ 300,000	$ 800,000
SMAQMD	Sacramento County	50	LNG	$ 216,130	$ 234,000
MDAQMD	Barstow, City of	10	L/CNG	$ 125,000	$ 248,000
SCAQMD					
	Foothill Transit	20	CNG	$ 200,000	$2,000,000
	Leggett & Platt	3	Electric	$ 4,000	$ 8,000
	OMNITRANS	113	CNG	$ 400,000	$4,900,000
	SYSCO	53	LNG	$ 200,000	$ 550,000
Total		**294**		**$1,830,210**	**$9,771,412**

2. Infrastructure Demonstration Challenges

Air districts have had difficulty identifying project participants who are able to meet the requirements of the Carl Moyer Infrastructure Demonstration Section. It was anticipated that public and private fleets would take advantage of the CMP when purchasing new trucks and buses that met the Air Resources Board's (ARB) optional NOx emission standard. This has not been the case. Lower NOx emission factors for refuse vehicles as specified in the November 2000 Carl Moyer Program Guidelines, and higher incremental cost for the lowest NOx emitting vehicles combine to make it difficult for fleets to qualify for Carl Moyer new vehicle funding. In addition, the statutory fuel throughput requirement of 14,280 million Btus annually requires a fleet to make a significant up-front monetary commitment in vehicle purchases before they can qualify for Carl Moyer Infrastructure Demonstration Section funding.

Cost sharing of infrastructure projects by itself is not enough to convince fleets and individuals to purchase new vehicles that meet the Air Resources Board's (ARB) optional low NOx standard. Those vehicles, which are able to meet the most stringent ARB emission requirements, have a higher cost associated with them. That higher cost should also be considered in the cost-effectiveness calculation for fueling facilities in an effort to get the cleanest technology available on the road in the shortest possible time. Often, the fleets that purchase this clean technology are also the fleets operating late model or post-1987 vehicles. Their purchase of an optional low NOx vehicle to replace one of their late model vehicles could also create a secondary market or resale market for those replaced late model vehicles. As more of these late model vehicles come to the secondary market, an operator of a pre-1987 high emission vehicle would have an opportunity to purchase a cleaner, mechanically-sound late model vehicle at a reasonable price instead of continuing to repair and operate an older truck.

3. Need for Additional Infrastructure Demonstration Funding

Based on CEC's experience with the infrastructure programs, there is a need for continued infrastructure funding. As can be seen from the above tables, many of the infrastructure projects funded cost in excess of $500,000 with some exceeding $1,000,000. The reason for this is that many of the program participants not only added fueling infrastructure but also upgraded the remainder of their facility to help integrate the introduction of new alternative fueled trucks. It is clear that reducing petroleum dependency while introducing new cleaner alternative fuel technology is not cheap, and additional financial considerations should be given to those companies and individuals willing to take this step into the future. Once infrastructure is established, there is an opportunity to increase the number of alternative fuel vehicles by the host fleet and by other nearby fleets. Eventually, a network of stations can be established. This increases flexibility of the fleet for vehicle deployment and provides the opportunity to utilize alternative fuel trucks throughout a region and the state. Without continued funding, a number of infrastructure projects may never be started and additional clean low-emission heavy-duty vehicles may never be purchased.

B. Advanced Technology Development Section

The Advanced Technology Development Section supports the development of advanced emission-reducing technologies for heavy-duty engines, including add-on and retrofit technologies. The Health and Safety Code also requires that each project shows a strong commercialization plan to bring the technology from development to full commercialization.

1. Advanced Technology Development Status

The CEC received a total of $4.2 million ($2 million for 1999-2000 and $2.2 million for 2000-2001) to fund advanced technology development projects under the CMP. The California Legislature has currently not provided additional funding for future advanced technology development program solicitations.

The CEC released PONs in November 1999 and November 2000 to solicit project applications. The PONs are solicitations for development of new and retrofit or add-on applications of both diesel and alternative fuel low-emission technologies. CEC funded three projects with FY 1999-2000 funds.

Table V-5
Advanced Technology Development Projects
FY 1999-2000

Recipient	Proposal Description	Grant Amount
Ceryx, Inc.	Quad CAT Converter for NOx Reduction	$632,653
Delphi Energy and Chassis Systems	Development of HD Non-Thermal Plasma Aftertreatment	$583,090
Engelhard Corp.	Development of an EGR system with DPX catalysts	$284,257

The CEC awarded an additional $500,000 to the South Coast Air Quality Management District (SCAQMD) for a joint solicitation with the Department of Energy's (DOE's) National Renewable Energy Laboratory (NREL) to help fund the development of low-emission heavy-duty natural gas engines (Table V-6).

Table V-6
Low-Emission Heavy-Duty Natural Gas
Engine Development Projects
FY 1999-2000

Recipient	Proposal Description
Detroit Diesel Corporation	0.5 g/bhp-hr NOx Advanced Fuel Control Natural Gas Engine Development
Cummins/Westport Innovations	0.5 g/bhp-hr NOx High-Pressure Direct-Injection Natural Gas Engine Development

The November 2000 PON solicited applications for FY 2000-2001. CEC received 12 qualifying applications, of which four were funded. A description of these projects is detailed in Table V-7.

Table V-7
Advanced Technology Development Projects
FY 2000-2001

Recipient	Proposal Description	Grant Amount
ISE Research Corp.	Development and Demonstration of Turbine-Driven Hybrid Electric Buses	$485,826
SCAQMD/Detroit Diesel Corp.	Development of Very-Low NOx HD Natural Gas Engine Reliability Augmentation Project	$200,000
Sorbent Technologies Corp.	Demonstration of a Retrofit NOx Filter for HD Stationary and Mobile Diesel Engines	$440,000
SCAQMD/NREL	Development and Demonstration of GTL-powered HD Vehicles Retrofitted with Control Technologies to Reduce NOx and PM	$400,000

The CEC also awarded $250,000 to the Clean Air Vehicle Technology Center to emission test Caltrans clean diesel service vehicles and the remaining $447,174 to the SCAQMD to fund a joint solicitation with NREL for the Next Generation Natural Gas Vehicle Program.

Cummins Westport, Inc. was awarded funding for two separate projects described in Table V-8.

Table V-8
Low-Emission Heavy-Duty Natural Gas
Engine Development Projects
FY 1999-2000

Recipient	Proposal Description
Cummins Westport, Inc.	Review and Development of Technologies for Next Generation Class 3-6 CNG Fueled Engines
Cummins Westport, Inc.	Preliminary Vehicle Design Development Proposal for the NREL Next Generation Natural Gas Vehicle

2. Project Description and Results

Ceryx proposed to build and demonstrate its QuadCAT® Four-Way Catalytic Converter device to reduce NOx, particulate matter (PM), hydrocarbon (HC), and carbon monoxide (CO) emissions from diesel engines. It was estimated that the proposed technology would reduce NOx by at least 45%, and PM, CO and HC by more than 90%. This technology does not require low sulfur fuel. The project did not proceed when the company encountered financial difficulty after an adverse press account about its principal and ceased operation.

Delphi Energy & Chassis Systems proposed to develop a heavy-duty diesel truck exhaust aftertreatment system using non-thermal plasma technology to reduce NOx by 80%, PM by 90%, and achieve these goals without increasing fuel consumption by more than 3%.

The project successfully developed a production-intent power supply and partially developed a low-cost NOx sensor. It found an unacceptably high fuel consumption of 8% (for both the electrical power and the fuel used for post injection), and an unacceptably low NOx reduction efficiency of 15% (over the light-duty European transient test). Delphi Corporation decided not to continue the development of novel catalyst technologies for NTP-assisted lean NOx control.

Engelhard proposed to collaborate with NREL and ARCO to develop a retrofit kit to reduce NOx using an Exhaust Gas Recirculation (EGR) system and a patented catalyzed soot filter (DPX™). The performance targets of 50% NOx reduction, 90% PM reduction, and 80% HC and CO reduction (H-D FTP cycle) would be demonstrated with ARCO's EC-

Diesel ultra-low-sulfur diesel (ULSD) fuel. Phase 1 is the design and construction of a prototype kit for fleet trial installation. Phase II is a fleet demonstration to monitor vehicle operation and perform chassis dynamometer testing.

Testing of a Cummins ISM 305 hp (for use by Los Angeles City Sanitation) over the composite cycle on ULSD shows that the EGR/DPX system reduces NOx by 47%, PM by 95%, HC by 91%, and CO by 74%. Testing at 350 hp over the FTP cycle shows reduced NOx by 47%, PM by 93%, HC by 97%, and CO by 51%. Testing of a Cummins ISM 280 hp (for use by AC Transit) over the composite cycle shows reduced NOx by 51%, PM by 92%, HC by 99.6%, and CO by 90%.

Detroit Diesel proposed a major redesign of its Series 50G 8.5-liter natural gas engine, primarily marketed for transit buses, based on the Series 50 and Series 60 diesel engines. The redesign involves improvement in cylinder head and piston bowl configurations and particularly air-fuel ratio control to optimize combustion stability and efficiency, and extend the lean misfire limit. These improvements were intended to allow certification to ARB's optional 0.5 g/bhp-hr NOx standard with no increase above the current PM level of 0.01 g/bhp-hr.

The project successfully developed the improved engine and certified it to the optional 1.2 g/bhp-hr NOx + NMHC standard. This makes it the cleanest transit bus engine currently available. Robust sales are proceeding.

Cummins and **Westport Innovations** proposed the further development of Westport's HPDI (high-pressure direct-injection) natural gas version of the Cummins 15 liter ISX diesel engine to attain 0.5 g/bhp-hr NOx emissions. The HPDI system injects a pilot quantity of diesel fuel (=10%) to initiate combustion and then injects the main charge of natural gas, providing the performance and fuel efficiency of a conventional diesel engine. The further development involves the addition of EGR and a variable geometry turbocharger (provided on the diesel base engine to meet October 2002 emission requirements) and recalibration for the higher level of EGR flows tolerable with natural gas to further reduce NOx emissions.

The project successfully developed the innovative engine design (renamed to "Westport Cycle®") and certified it to the optional 1.5 g/bhp-hr NOx + NMHC standard. This makes it the cleanest over-the-road truck engine while maintaining the high fuel efficiency of the base diesel engine. Pilot production is anticipated in 2004, starting with a demonstration of 25 trucks with XRT Express Reefer Transport in Southern California.

ISE Research Corp. proposed to develop and demonstrate a 60 kW Capstone MicroTurbine integrated into propane-powered series electric hybrid 30 ft. transit buses operated by the Los Angeles Department of Transportation. Prototypes of this new engine have achieved emission test results below the 2007-2010 standards of 0.20 g/bhp-hr NOx, using a hybrid vehicle test cycle approved by ARB. The turbine engine was to be developed to use diesel fuel, propane, or natural gas.

The project switched to a heavy-duty gasoline engine (Ford 6.8 liter V-10) due to delayed

availability of the 60kW turbine and proceeded to develop the electric hybrid technology with this engine for transit bus application. The Ford V-10 engine is also available for natural gas and under development for hydrogen. The 30-ft. demonstration buses are in service. The project has successfully received certification from ARB at 0.4 g/bhp-hr NOx and an order for up to 100 40-ft. transit buses has been accepted.

Sorbent Technologies Corp. proposed to further develop a technology originally developed to reduce NOx emissions from jet-engine test facilities and demonstrate on heavy-duty stationary diesels and large truck engines. The technology involves adsorption of NOx followed by desorption and Selective NOx Recirculation back into the engine, reducing NOx emissions by up to 90%.

The project demonstrated an easily-retrofitable, cost-effective NOx-control technology for heavy-duty diesel engines using a special carbon-based sulfur-tolerant, high-capacity NOx-selective sorbent material. The proponent concludes that over 70% removal and decomposition of NOx is possible and plans to continue to develop the technology and seek partners for commercialization.

SCAQMD and **NREL** proposed to develop and demonstrate heavy-duty diesel vehicles fueled with Fischer-Tropsch "GTL" synthetic diesel and retrofitted with a modified combustion system and aftertreatment systems to reduce NOx and PM emissions. The proponents selected Ricardo Inc. to manage the project, Automotive Testing Laboratories Inc. (ATL) for emission testing, and Ralph's Grocery as the test fleet with 2-1995 Freightliner Model 11264 Class 8 truck tractors with Cummins 330-hp M11 engines.

The project demonstrated NOx reductions of 44% and PM reductions of 96% with the combination of engine modifications and active aftertreatment with the Fischer-Tropsch Diesel (FTD). Project proponents anticipate widespread use of FTD in California based on these results.

Cummins Westport, Inc. proposed to develop an upgraded B-Series natural gas engine for truck classes 3-6 with emissions at or below 0.5 g/bhp-hr NOx and 0.01 g/bhp-hr PM. The project was to upgrade the B5.9G, starting with *plus* technologies (diesel engine computer controls and diagnostics) plus recalibration to reach 1.2 g/bhp-hr NOx, followed by evaluation of NOx adsorber aftertreatment technology from EmeraChem to reach 0.5 g/bhp-hr NOx. The last element is an evaluation to determine the system best suited to deliver 0.2 g/bhp-hr NOx and 0.01 g/bhp-hr PM.

The project developed a single bed NOx storage and reduction (NSR) catalyst system capable of achieving 0.6 g/bhp-hr NOx, but identified the need for improved catalyst durability and reduced catalyst inlet temperatures. The project also determined the system best suited to reach 0.2 g/bhp-hr NOx would be a stoichiometric spark-ignited system with EGR and a three-way catalyst, or a direct injection hot-surface ignition system (that requires a longer development period).

Cummins Westport, Inc. separately proposed with PACCAR Inc. to develop a Class 3-6

vehicle primarily for CNG and a Class 7-8 vehicle primarily for LNG. The project involves careful screening of vocations, chassis, and engines, with life cycle cost modeling and customer input, to determine business cases for the final choices.

The project has made progress in identifying vocations suitable for NGV market focus, including refuse collection and transfer trucks. The project has also identified a range of Kenworth and Peterbilt chassis and current and prospective CWI natural gas engines, but has not yet reached final conclusions.

Clean Air Vehicle Technology Center provided technical support and emission testing to evaluate the Department of Transportation (Caltrans) "Greening of the Fleet" Program. The goals were to determine the NOx, PM, and total hydrocarbon (THC) emission reduction potential of a range of clean diesel technologies in normal Caltrans service and help Caltrans secure NOx and PM retrofit verification under the ARB interim retrofit procedures.

The emission testing shows that FTD fuels in conjunction with passive NOx and PM aftertreatment can achieve a reduction of NOx emissions of up to 19%, with an average benefit of 10% for the New York Bus Cycle and 8% for the HD Urban Driving Cycle. PM benefits are up to 90% with FTD and aftertreatment and 65% with PuriNox™ aqueous diesel fuel with aftertreatment. THC benefits are nearly 100% with particulate traps, and 80% with PuriNox™ and aftertreatment.

Project Fact Sheets and final reports are available at www.energy.ca.gov.

3. Additional Funding for Advanced Technology Development Projects

As future emission regulations become increasingly stringent, there will be a continuing need to foster the development of low-emission heavy-duty engine technology. The more stringent standards adopted for 2004, 2007, and 2010 engines reduce the emission benefits from existing low-emission engines and reduce their cost-effectiveness for prospective customers. Continued development of technologies that provide emission levels lower than required by regulation, or in advance of regulatory requirements, can provide a range of cost-effective options that qualify for CMP incentives. However, engine and vehicle manufacturers need outside financial support to justify continued development and commercialization of such technology options due to limited market demand.

There is a provision in the engine portion of the CMP to fund add-on equipment or retrofits. This type of technology can provide significant cost-effective reductions. However, there is a lack of available technology. The Advanced Technology Development section of the CMP offers a level of financial assistance to technology developers to reduce the risk in developing these types of innovative technologies.